APRIL - JUNE 1990 QUARTERLY REPORT

Scientific Observation Hole (SOH) Program

Geothermal Resource Permit: GRP 89-1

Lilewa, Kapoho, and Halekamahina, Hawaii

TMK: 1-2-10:01; 1-4-01:02; and 1-4-02:32

Hawaii Natural Energy Institute

University of Hawaii

July 1990

SUMMARY

This document presents a quarterly report to the County of Hawaii Planning Department to support the scientific observation hole (SOHs) program in the Kilauea middle and lower east rift zone. The SOHs are for scientific observation purposes only. The holes will not be flow-tested or produced. The information to be gained from the SOHs will provide an assessment of subsurface geological conditions, groundwater level and composition, temperature, drilling conditions, an inventory of possible mineral and geothermal resources, and an eruptive history of the island to the depth drilled.

This report addresses: description of work under taken and planned; results of the environmental and noise monitoring activities; log of complaints; status of exploration activities; other information; and financial accounting.

I. INTRODUCTION

The County of Hawaii Planning Commission approved, on August 8, 1989, a geothermal resource permit application (GRP 89-1) to drill scientific observation holes (SOHs) in the Kilauea middle and lower east rift zone. This document presents a quarterly report, as required in condition 11:

> "The petitioner shall submit five (5) copies of a status report to the Planning Department on a quarterly basis (by the first day of January, April, July, and October of each year), or, within 30 days of the completion of any SOH. The status report shall include, but not limited to:
>
> a. A detailed description of the work undertaken during the current reporting period including drilling activity report;
>
> b. A description of the work being proposed over the next reporting period;
>
> c. The results of the environmental/noise monitoring activities;
>
> d. A log of the complaints received and the responses thereto;
>
> e. The current status of exploration activities in the context of long-range program goals; and
>
> f. Any other information that the Planning Department may require which will address environmental and regulatory concerns involving the requirements of the Geothermal Resources Permit.
>
> g. This condition shall remain in effect until all of the conditions of approval have been complied with, then after which these reports shall be every six (6) months for the duration of the project.

from the mud pit, and transported samples to test laboratory.

Noise consultants were on-site for field measurements and recommendations to reduce noise by possibly another 5-10 decibels. These recommendations which require rig modification will be implemented after SOH 4 drilling is completed.

Description of Proposed Work

Various logs (i.e. temperature, pressure) and water sampling will be conducted in the hole on a periodic basis. The wellpad will be fenced. The mud and cuttings in the sump pit will be disposed in a manner recommended by the Department of Health after they review the analysis from the test laboratory. The drill site will be replanted with ohia seedlings, as recommended by Department of Land and Natural Resources forestry officials.

Results of the Environmental/Noise Monitoring Activities

Passive hydrogen sulfide (H_2S) monitors were installed around the SOH 4 drill site. No H_2S emissions were detected during this reporting period.

A monitoring station was setup to measure air quality. These instruments provided a continuous record of atmospheric H_2S concentrations when interfaced with a data logger or chart recorder. The unit is located in a utility van on-site and power is provided by the drill rig system.

Continuous wind speed and direction measurements were made with a recording wind speed/direction sensor system. A data logger and back-up

pressure-sensitive recorder collects the wind speed and direction data. The unit is located in a utility van on-site and power is provided by the drill rig system. The height of the sensor location was increased to 16 feet.

Noise measurements at different locations were continued around the SOH 4 site. In addition, a permanent noise monitoring station was located at the SOH 4 site during drilling.

Few and infrequent problems were experienced due to power failure and various equipment malfunctions. In general, data collection was excellent. Detailed data are presented in the monthly reports.

Complaint Log and Response

Some noise complaints were received during this reporting period. See Appendix B for complaint notice and response. The noise consultant analysis reports for these complaints are in Appendix C. Analysis shows that SOH 4 drilling operations were within conditions set forth by Geothermal Resource Permit (GRP 89-1).

IV. SOH 1 SITE

Description of Current Work

Tonto drilling services commenced drilling activities at 3:00 pm on Thursday, May 31, 1990. Tonto drilling services continued drilling activities to a depth of 202 feet where the 9 5/8-inch casing was set and cemented, and the blowout preventer equipment tested by June 9, 1990. At which time the drill rig was put on standby operation for 6 days until the Planning

Commission granted permission to continue on June 14, 1990.

Core drilling continued to a depth of 1,802 feet as of June 30, 1990. See Appendix D for drilling reports of SOH 1.

Description of Proposed Work

Tonto Drilling Services will continue core drilling to a depth range of 4,000 to 6,500 feet. Then various logs (i.e. temperature, pressure, electrical, geophysical, etc.) will be conducted in the hole before the installation of the tubing. A high pressure wellhead valve will be welded to the casing, the wellpad fenced and secured. The mud and cuttings in the sump pit will be disposed in a similar manner recommended by the Department of Health for SOH 4.

Results of the Environmental/Noise Monitoring Activities

Passive hydrogen sulfide (H_2S) monitors were installed around the SOH 1 drill site. No H_2S emissions were detected during this reporting period.

A monitoring station was relocated from SOH 4 and setup to measure air quality at SOH 1. These instruments provided a continuous record of atmospheric H_2S concentrations when interfaced with a data logger or chart recorder. The unit is located in a utility van on-site and power is provided by the drill rig system.

Continuous wind speed and direction measurements were made with a recording wind speed/direction sensor system relocated from SOH 4. A data

logger and back-up pressure-sensitive recorder collects the wind speed and direction data. The unit is located in a utility van on-site and power is provided by the drill rig system. The height of the sensor location was increased to 16 feet.

A noise monitoring station is located at the SOH 1 site during drilling. Noise consultants recommendations to reduce noise by possibly another 5-10 decibels involving rig modification were implemented. The air flow to the diesel engines were re-routed, so noise insulation compartments could be installed at centralized intake and exhaust ports (see Appendix E for noise consultants recommendations). Sound mufflers were also installed at the top of the drill mast and at the rear of the drill rig. A second noise station is located at the Laughlin residence, about a quarter mile west of SOH 1 drill site.

Complaint Log and Response

Some noise complaints were received during this reporting period. See Appendix F for complaint notice and response. The noise consultant analysis reports for these complaints are in Appendix G. Analysis shows that SOH 1 drilling operations were within conditions set forth by Geothermal Resource Permit (GRP 89-1).

V. SOH 3 SITE

Description of Current Work

No drilling activity has been initiated. Access to the SOH 3 site has not been constructed, nor has the site been cleared or graded. Ambient noise

monitoring has been initiated in residential areas near SOH 3 site.

Description of Proposed Work

Preliminary work for drill site access initiated. SOH 3 will be to the north of the existing True/Mid-Pacific drill pad in a grubbed area. Tentative plans call for directional drilling from this pad in the northerly direction.

Results of the Environmental/Noise Monitoring Activities

Ambient noise measured at SOH 4 will be used for SOH 3 site.

Complaint Log and Response

No complaints were received during this reporting period.

VI. SOH 2 SITE

Description of Current Work

No drilling activity has been initiated. Ambient noise monitoring is being prepared for SOH 2 site. Findings of the flora/fauna field surveys were submitted to County of Hawaii Planning Department. Permit application was approved by Department of Land and Natural Resources to inspect, modify, and if practical install a pump into existing airstrip well to supply water for drilling operations.

Grading and grubbing permit has been submitted to the County of Hawaii Planning Department.

Description of Proposed Work

Once survey work is completed a grading/grubbing permit application will be submitted to County of Hawaii.

Results of the Environmental/Noise Monitoring Activities

Ambient noise surveys will be recorded at appropriate sites.

Complaint Log and Response

No complaints were received during this reporting period.

VII. STATUS OF CURRENT EXPLORATION ACTIVITIES

No activities being pursued at this time, other than drilling at SOH 1, and permit activities at SOH 3 and SOH 2.

VIII. OTHER INFORMATION

No concerns need to be addressed at this time.

IX. FINANCIAL REPORT

See Appendix H for budget status.

APPENDIX A

DAILY DRILLING REPORTS -- SOH 4

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	04-01-90
Period Start	0700 3-31-90	Spud Date	12-13-89
Period End	0700 4-01-90	Day #	96
Depth Start	3462 ft.	Contractor/Rig	Tonto/U-5000
Depth End	3510 ft.	Day Shift-	
Footage	48 ft.	Driller	Cunningham
Mud Wt	8.4#/gal	Helper	Riley
Mud Vis	40 sec	Helper	
Mud pH	8.0	Night Shift-	
Mud Temp(F): IN	72 OUT N/A	Driller	LaOrange
LC. @		Helper	K.K.
		Helper	Hanson
		Foreman	Fierback
Bits:	HQ bit #GP7194-2 on @ 3,490 ft.	Drilling Mgr	Deymonaz

Additional Information: CORE WITH HQ FROM 3,462-3,490 FT WITHOUT RETURNS. CROWN ON BIT FAILED (FLAW IN BIT CONSTRUCTION) TRIP OUT OF HOLE, CHANGE BITS, TRIP IN HOLE AND CORE FROM 3490-3510 FT. FLUID LEVEL MEASURED WHILE RETRIEVING CORE BARREL REMAINING CONSTANT @ 800-850 FT. ROCK TYPE: SUBMARINE VOLCANICS.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 3,510	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	04-02-90
Period Start	0700 4-01-90	Spud Date	12-13-89
Period End	0700 4-02-90	Day #	97
Depth Start	3510 ft.	Contractor/Rig	Tonto/U-5000
Depth End	3610 ft.	Day Shift-	
Footage	100 ft.	Driller	Cunningham
Mud Wt	8.4#/gal	Helper	Riley
Mud Vis	39 sec	Helper	
Mud pH	8.0	Night Shift-	
Mud Temp(F):IN	72 OUT N/R	Driller	LaOrange
LC. @		Helper	K.K.
		Helper	Hanson
		Foreman	Fierback
Bits:		Drilling Mgr	Deymonaz

Additional Information: CORE WITH HQ FROM 3,490-3,610 FEET WITHOUT RETURNS. FLUID LEVEL MEASURED WHILE RETRIEVING CORE BARREL REMAINING CONSTANT AT 850-900 FEET. ROCK TYPE: SUB-MARINE VOLCANICS AND DENSE FINE GRAINED INTRUSIVES. INCREASE IN SULFIDES, ZEOLITES CALCITE & MINOR QUARTZ FILLING VESICLES AND FRACTURES BELOW 3,475 FT. BOTTOM HOLE TEMP. SURVEY AT 3,540 AND 3,590 FT. REGISTERED 200 (F) AND 208 (F).

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 3,610	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	04-03-90
Period Start	0700 4-02-90	Spud Date	12-13-89
Period End	0700 4-03-90	Day #	98
Depth Start	3610 ft.	Contractor/Rig	Tonto/U-5000
Depth End	3706 ft.	Day Shift-	
Footage	96 ft.	Driller	Cunningham
Mud Wt	8.4#/gal	Helper	Riley
Mud Vis	40 sec	Helper	
Mud pH	8.0	Night Shift-	
Mud Temp(F):IN	71 OUT N/R	Driller	LaOrange
LC. @		Helper	J.K.
		Helper	Hanson
		Foreman	Fierback
Bits:		Drilling Mgr	Deymonaz

Additional Information: CORE WITH HQ FROM 3,610-3,706 FEET WITHOUT RETURNS. FLUID LEVEL IN HOLE AT 750-800 FT. ROCK TYPE: FRACTURED SUBMARINE VOLCANICS AND DENSE, FINE GRAINED INTRUSIVES. BOTTOM HOLE TEMPERATURES AT 3,647 AND 3,698 FT WERE 236 (F) AND 230 (F).

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 3,706	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	04-04-90
Period Start	0700 4-03-90	Spud Date	12-13-89
Period End	0700 4-04-90	Day #	99
Depth Start	3706 ft.	Contractor/Rig	Tonto/U-5000
Depth End	3796 ft.	Day Shift-	
Footage	90 ft.	Driller	Cunningham
Mud Wt	8.4#/gal	Helper	Riley
Mud Vis	38 sec	Helper	
Mud pH	8.0	Night Shift-	
Mud Temp(F): IN	72 OUT N/A	Driller	LaOrange
LC. @		Helper	J.K.
		Helper	Hanson
		Foreman	Fierback
Bits:		Drilling Mgr	Deymonaz

Additional Information: CORE WITH HQ FROM 3,706-3,796 FEET WITHOUT RETURNS. FLUID LEVEL MEASURED WHILE RETRIEVING CORE BARREL AT 750-800 FEET. ROCK TYPE: FINE GRAINED, DENSE INTRUSIVES WITH MINOR VESICULAR SUBMARINE VOLCANICS.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 3,796	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	04-05-90
Period Start	0700 4-04-90	Spud Date	12-13-89
Period End	0700 4-05-90	Day #	100
Depth Start	3796 ft.	Contractor/Rig	Tonto/U-5000
Depth End	3885 ft.	Day Shift-	
Footage	89 ft.	Driller	Cunningham
Mud Wt	8.4#/gal	Helper	Riley
Mud Vis	N/R	Helper	
Mud pH	8.0	Night Shift-	
Mud Temp(F):IN	72 OUT N/R	Driller	LaOrange
LC. @		Helper	J.K.
		Helper	Hanson
		Foreman	Fierback
Bits:		Drilling Mgr	Deymonaz

Additional Information: CORE WITH HQ FROM 3,796-3,885 FEET WITHOUT RETURNS. FLUID LEVEL IN HOLE AT 750-800 FEET. ROCK TYPE: FRACTURED SUBMARINE VOLCANICS AND DENSE, FINE GRAINED, INTRUSIVES. BOTTOM HOLE TEMPERATURES AT 3,796 AND 3,846 FEET WERE 264 (F) AND 255 (F).

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 3,885	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	04-06-90
Period Start	0700 4-05-90	Spud Date	12-13-89
Period End	0700 4-06-90	Day #	101
Depth Start	3885 ft.	Contractor/Rig	Tonto/U-5000
Depth End	3962 ft.	Day Shift-	
Footage	77 ft.	Driller	Cunningham
Mud Wt	8.4#/gal	Helper	Riley
Mud Vis	N/R	Helper	
Mud pH	8.0	Night Shift-	
Mud Temp(F): IN	N/R OUT N/R	Driller	LaOrange
LC. @		Helper	K.K.
		Helper	Hanson
		Foreman	Fierback
Bits:		Drilling Mgr	Deymonaz

Additional Information: CORE WITH HQ FROM 3,885-3,962 FEET WITHOUT RETURNS. FLUID LEVEL IN HOLE AT 700 FEET. BOTTOM HOLE TEMPERATURE SURVEYS: 270 (F) AT 3,895 FT AND 278 (F) AT 3,944 FT.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 3,962	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	04-07-90
Period Start	0700 4-06-90	Spud Date	12-13-89
Period End	0700 4-07-90	Day #	102
Depth Start	3962 ft.	Contractor/Rig	Tonto/U-5000
Depth End	4052 ft.	Day Shift-	
Footage	90 ft.	Driller	Cunningham
Mud Wt	8.4#/gal	Helper	Riley
Mud Vis	N/R	Helper	
Mud pH	N/R	Night Shift-	
Mud Temp(F):IN	72 OUT N/A	Driller	LaOrange
LC. @		Helper	K.K.
		Helper	Hanson
		Foreman	Fierback
Bits:		Drilling Mgr	Deymonaz

Additional Information: CORE HQ FROM 3,962-4,052 FT WITHOUT RETURNS. FLUID LEVEL AT 650-700 FEET. BOTTOM HOLE TEMPERATURE: 288 (F) AT 4,002 FEET.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 4,052	N/A	N/A

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DAILY DRILLING REPORT

Hole # SOH-4
Period Start 0700 4-07-90
Period End 0700 4-08-90
Depth Start 4052 ft.
Depth End 4090 ft.
Footage 38 ft.
Mud Wt 8.4#/gal
Mud Vis N/R
Mud pH N/R
Mud Temp(F):IN 71 OUT N/A
LC. @

Bits: HQ bit #M6-3564-9 on @ 4,058 ft.

Date 04-08-90
Spud Date 12-13-89
Day # 103
Contractor/Rig Tonto/U-5000
Day Shift-
Driller Cunningham
Helper Riley
Helper
Night Shift-
Driller LaOrange
Helper K.K
Helper Hanson
Foreman Fierback
Drilling Mgr Deymonaz

Additional Information: CORE HQ FROM 4,052-4,058 FEET, TRIP FOR BIT CHANGE. RUN IN HOLE, ONE HOUR WASHING BACK TO BOTTOM, CORE FROM 4,058-4,090 FT. WITHOUT RETURNS. BOTTOM HOLE TEMP: 292 (F) AT 4,052 FT.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 4,090	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	04-09-90
Period Start	0700 4-08-90	Spud Date	12-13-89
Period End	0700 4-09-90	Day #	104
Depth Start	4090 ft.	Contractor/Rig	Tonto/U-5000
Depth End	4170 ft.	Day Shift-	
Footage	80 ft.	Driller	Cunningham
Mud Wt	8.4#/gal	Helper	Riley
Mud Vis	N/R	Helper	
Mud pH	N/R	Night Shift-	
Mud Temp(F):IN	72 OUT N/A	Driller	LaOrange
LC. @		Helper	K.K.
		Helper	Hanson
		Foreman	Fierback
Bits:		Drilling Mgr	Deymonaz

Additional Information: CORE HQ FROM 4,090-4,170 FEET WITHOUT RETURNS. FLUID LEVEL AT 700-750 FT. ROD VIBRATION INCREASING BELOW 3,900 FT, ADDITION OF TORQUESE (WATER SOLUABLE LUBRICANT) TO DRILLING FLUID APPEARS TO HAVE ELIMINATED PROBLEM. BOTTOM HOLE TEMP: 260 (F) AT 4,110 FT. AND 280 (F) AT 4,160 FT.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 4,170	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	04-10-90
Period Start	0700 4-09-90	Spud Date	12-13-89
Period End	0700 4-10-90	Day #	105
Depth Start	4170 ft.	Contractor/Rig	Tonto/U-5000
Depth End	4258 ft.	Day Shift-	
Footage	88 ft.	Driller	Cunningham
Mud Wt	8.4#/gal	Helper	Riley
Mud Vis	N/R	Helper	
Mud pH	8.0	Night Shift-	
Mud Temp(F):IN	72 OUT N/R	Driller	LaOrange
LC. @		Helper	J.K.
		Helper	Hanson
		Foreman	Gillespie
Bits:		Drilling Mgr	Deymonaz

Additional Information: CORE HQ FROM 4,170-4,258 FEET WITHOUT RETURNS. FLUID LEVEL IN HOLE 500-600 FEET. BOTTOM HOLE TEMP: AT 4,209 FT. 285 (F).

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 4,258	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	04-11-90
Period Start	0700 4-10-90	Spud Date	12-13-89
Period End	0700 4-11-90	Day #	106
Depth Start	4258 ft.	Contractor/Rig	Tonto/U-5000
Depth End	4347 ft.	Day Shift-	
Footage	89 ft.	Driller	Cunningham
Mud Wt	8.4#/gal	Helper	Riley
Mud Vis	N/R	Helper	
Mud pH	N/R	Night Shift-	
Mud Temp(F):IN	72 OUT N/A	Driller	LaOrange
LC. @		Helper	J.K.
		Helper	Hanson
		Foreman	Gillespie
Bits:		Drilling Mgr	Deymonaz

Additional Information: CORE HQ FROM 4,258-4,347 FEET WITHOUT RETURNS. FLUID LEVEL MEASURED WHILE RETRIEVING CORE BARREL AT 500-550 FT. BOTTOM HOLE TEMPERATURE SURVEY: 299 (F) @ 4,258 FT AND 304 (F) @ 4,307 FT.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 4,347	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	04-12-90
Period Start	0700 4-11-90	Spud Date	12-13-89
Period End	0700 4-12-90	Day #	107
Depth Start	4347 ft.	Contractor/Rig	Tonto/U-5000
Depth End	4435 ft.	Day Shift-	
Footage	88 ft.	Driller	Cunningham
Mud Wt	8.4#/gal	Helper	Riley
Mud Vis	N/R	Helper	
Mud pH	N/R	Night Shift-	
Mud Temp(F):	IN 72 OUT N/R	Driller	LaOrange
LC. @		Helper	J.K.
		Helper	Hanson
		Foreman	Gillespie
Bits:		Drilling Mgr	Deymonaz

Additional Information: CORE HQ FROM 4,347-4,435 FEET WITHOUT RETURNS. FLUID LEVEL MEASURED WHILE RETRIEVING CORE BARREL REMAINING CONSTANT AT 450-500 FT. BOTTOM HOLE TEMPERATURE SURVEY: 314 (F) @ 4,357 FT. AND 323 (F) @ 4,406 FT.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 4,435	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	04-13-90
Period Start	0700 4-12-90	Spud Date	12-13-89
Period End	0700 4-13-90	Day #	108
Depth Start	4435 ft.	Contractor/Rig	Tonto/U-5000
Depth End	4524 ft.	Day Shift-	
Footage	89 ft.	Driller	Cunningham
Mud Wt	8.4#/gal	Helper	Riley
Mud Vis	32 sec	Helper	
Mud pH	8.5	Night Shift-	
Mud Temp(F):IN	73 OUT N/R	Driller	LaOrange
LC. @		Helper	J.K.
		Helper	Hanson
		Foreman	Gillespie
Bits:		Drilling Mgr	Deymonaz

Additional Information: CORE HQ FROM 4,435-4,524 FEET WITHOUT RETURNS. FLUID LEVEL MEASURED WHILE RETRIEVING CORE BARREL REMAINING CONSTANT AT 400-500 FT. BOTTOM HOLE TEMPERATURE SURVEY: 331 (F) @ 4,455 FT. AND 338 (F) @ 4,504 FT.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 4,524	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	04-14-90
Period Start	0700 4-13-90	Spud Date	12-13-89
Period End	0700 4-14-90	Day #	109
Depth Start	4524 ft.	Contractor/Rig	Tonto/U-5000
Depth End	4613 ft.	Day Shift-	
Footage	89 ft.	Driller	Cunningham
Mud Wt	8.4#/gal	Helper	Riley
Mud Vis	32 sec	Helper	
Mud pH	8.5	Night Shift-	
Mud Temp(F):IN	73 OUT N/R	Driller	LaOrange
LC. @		Helper	J.K.
		Helper	Hanson
		Foreman	Gillespie
Bits:		Drilling Mgr	Deymonaz

Additional Information: CORE HQ FROM 4,524-4,613 FEET WITHOUT RETURNS. FLUID LEVEL MEASURED WHILE RETRIEVING CORE BARREL REMAINING CONSTANT AT 375-450 FT. BOTTOM HOLE TEMPERATURE SURVEY: 340 (F) @ 4,553 FT. AND 340 (F) @ 4,603 FT.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 4,613	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	04-15-90
Period Start	0700 4-14-90	Spud Date	12-13-89
Period End	0700 4-15-90	Day #	110
Depth Start	4613 ft.	Contractor/Rig	Tonto/U-5000
Depth End	4701 ft.	Day Shift-	
Footage	88 ft.	Driller	Cunningham
Mud Wt	8.4#/gal	Helper	Riley
Mud Vis	34 sec	Helper	
Mud pH	8.5	Night Shift-	
Mud Temp(F):IN	72 OUT N/R	Driller	LaOrange
LC. @		Helper	J.K.
		Helper	Hanson
		Foreman	Gillespie
Bits:		Drilling Mgr	Deymonaz

Additional Information: CORE HQ FROM 4,613-4,701 FEET WITHOUT RETURNS. FLUID LEVEL MEASURED WHILE RETRIEVING CORE BARREL REMAINING CONSTANT AT 375-450 FT. BOTTOM HOLE TEMPERATURE SURVEY: 356 (F) @ 4,652 FT. AND 340 (F) @ 4,701 FT.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 4,701	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	04-16-90
Period Start	0700 4-15-90	Spud Date	12-13-89
Period End	0700 4-16-90	Day #	111
Depth Start	4701 ft.	Contractor/Rig	Tonto/U-5000
Depth End	4743 ft.	Day Shift-	
Footage	42 ft.	Driller	Cunningham
Mud Wt	8.4#/gal	Helper	Riley
Mud Vis	33 sec	Helper	
Mud pH	8.5	Night Shift-	
Mud Temp(F):	IN 73 OUT N/R	Driller	LaOrange
LC. @		Helper	J.K.
		Helper	Hanson
		Foreman	Gillespie
Bits:	HQ #M6-3564-19 on at 4,731 ft.	Drilling Mgr	Deymonaz

Additional Information: CORE HQ FROM 4,701-4,743 FEET WITHOUT RETURNS. TRIP RODS FOR BIT CHANGE AT 4,731 FEET AND TAKE DEVIATION SURVEY AT 120 FT. INTERVALS FROM 2,000-3,000 FT. SURVEY RESULTS WILL BE ON APRIL 17 REPORT. FLUID LEVEL MEASURED WHILE RETRIEVING CORE BARREL AT 400-450 FEET. NO BOTTOM HOLE TEMPERATURE SURVEYS DURING THIS PERIOD.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 4,743	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	04-17-90
Period Start	0700 4-16-90	Spud Date	12-13-89
Period End	0700 4-17-90	Day #	112
Depth Start	4743 ft.	Contractor/Rig	Tonto/U-5000
Depth End	4811 ft.	Day Shift-	
Footage	68 ft.	Driller	Cunningham
Mud Wt	8.4#/gal	Helper	Riley
Mud Vis	34 sec	Helper	
Mud pH	8.0	Night Shift-	
Mud Temp(F):IN	72 OUT N/R	Driller	LaOrange
LC. @		Helper	J.K.
		Helper	Hanson
		Foreman	Gillespie
Bits:		Drilling Mgr	Deymonaz

Additional Information: CORE HQ FROM 4,743-4,811 FEET WITHOUT RETURNS. FLUID LEVEL AT 450-500 FEET. BOTTOM HOLE TEMPERATURES AT 354 (F) @ 4,753 AND 352 (F) @ 4,802 FEET.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 4,811	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	04-18-90
Period Start	0700 4-17-90	Spud Date	12-13-89
Period End	0700 4-18-90	Day #	113
Depth Start	4811 ft.	Contractor/Rig	Tonto/U-5000
Depth End	4890 ft.	Day Shift-	
Footage	79 ft.	Driller	Cunningham
Mud Wt	8.4#/gal	Helper	Riley
Mud Vis	33 sec	Helper	
Mud pH	8.0	Night Shift-	
Mud Temp(F):IN	73 OUT N/R	Driller	LaOrange
LC. @		Helper	J.K.
		Helper	Hanson
		Foreman	Gillespie
Bits:		Drilling Mgr	Deymonaz

Additional Information: CORE HQ FROM 4,811-4,890 FEET WITHOUT RETURNS. FLUID LEVEL AT 350-450 FEET. BOTTOM HOLE TEMPERATURE AT 356 (F) @ 4,851 FT. BROKE WIRELINE WHILE RETRIEVING CORE BARREL AT 4,890 FEET. BEGIN TRIPPING RODS TO RETREIVE CORE BARREL AND CABLE.

Deviation Survey, 4-15-90:

Run	Depth	Bearing	Degrees	Run	Depth	Bearing	Degrees
#1	3,600	S-84-W	0.50	#6	2,880	S-50-W	0.25
#2	3,480	S-29-W	0.50	#7	2,760	camera failed	
#3	3,360	S-37-W	0.75	#8	2,640	S-82-W	0.50
#4	3,240	N-54-W	0.25	#9	2,400	S-67-W	0.50
#5	3,120	0	0.00	#10	2,280	S-62-W	0.75
#6	3,000	camera failed		#11	2,160	S-9-E	0.50

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 4,890	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	04-19-90
Period Start	0700 4-18-90	Spud Date	12-13-89
Period End	0700 4-19-90	Day #	114
Depth Start	4890 ft.	Contractor/Rig	Tonto/U-5000
Depth End	4935 ft.	Day Shift-	
Footage	45 ft.	Driller	Cunningham
Mud Wt	8.4#/gal	Helper	Riley
Mud Vis	N/R	Helper	
Mud pH	N/R	Night Shift-	
Mud Temp(F):IN	72 OUT N/A	Driller	LaOrange
LC. @		Helper	J.K.
		Helper	Hanson
		Foreman	Gillespie
Bits:		Drilling Mgr	Deymonaz

Additional Information: TRIP OUT OF HOLE, RETRIEVE CORE BARREL AND BROKEN WIRELINE. TRIP IN HOLE AND CORE HQ FROM 4,890-4,935 FT WITHOUT RETURNS. FLUID LEVEL MEASURED WHILE RETRIEVING CORE BARREL AT 300-400 FT. BOTTOM HOLE TEMPERATURE SURVEY: 383 (F) AT 4,905 FT.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 4,935	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	04-20-90
Period Start	0700 4-19-90	Spud Date	12-13-89
Period End	0700 4-20-90	Day #	115
Depth Start	4935 ft.	Contractor/Rig	Tonto/U-5000
Depth End	5018 ft.	Day Shift-	
Footage	83 ft.	Driller	Cunningham
Mud Wt	8.4#/gal	Helper	Riley
Mud Vis	43 sec.	Helper	
Mud pH	9.0	Night Shift-	
Mud Temp(F):IN	73 OUT N/R	Driller	LaOrange
LC. @		Helper	K.K.
		Helper	Hanson
		Foreman	Gillespie
Bits:		Drilling Mgr	Deymonaz

Additional Information: CORE WITH HQ FROM 4,935-5,018 FEET WITHOUT RETURNS. FLUID LEVEL IN HOLE AT 350 FT BOTTOM HOLE TEMPERATURE OF 390^{0}(F) AT 4,954 FT. AND 393^{0}(F) AT 5,004 FT. FORMATION BECOMING MORE FRACTURED AND BROKEN BELOW 5,000 FT. RESULTING IN SHORT CORE RUNS.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 5,018	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	04-21-90
Period Start	0700 4-20-90	Spud Date	12-13-89
Period End	0700 4-21-90	Day #	116
Depth Start	5018 ft.	Contractor/Rig	Tonto/U-5000
Depth End	5073 ft.	Day Shift-	
Footage	55 ft.	Driller	Cunningham
Mud Wt	8.4#/gal	Helper	Riley
Mud Vis	44 sec.	Helper	
Mud pH	9.0	Night Shift-	
Mud Temp(F):	IN 72 OUT N/R	Driller	LaOrange
LC. @		Helper	K.K.
		Helper	Hanson
		Foreman	Gillespie
Bits:		Drilling Mgr	Deymonaz

Additional Information: CORE WITH HQ FROM 5,018-5,073 FEET WITHOUT RETURNS. FLUID LEVEL MEASURED WHILE RETRIEVING CORE BARREL REMAINING CONSTANT AT 300-350 FEET. FORMATION VERY BROKEN, SOME POORLY CONSOLIDATED SANDY INTERVALS UP TO 7 FT. THICK. APPEARS TO BE TURBIDITE DEPOSIT. SOME SQUEEZING, REQUIRING REDRILLING SOME INTERVALS. DUE TO INSTABILITY OF FORMATION, NO BOTTOM HOLE TEMPERATURES WERE MADE.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 5,073	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	04-22-90
Period Start	0700 4-21-90	Spud Date	12-13-89
Period End	0700 4-22-90	Day #	117
Depth Start	5073 ft.	Contractor/Rig	Tonto/U-5000
Depth End	5098 ft.	Day Shift-	
Footage	25 ft.	Driller	Cunningham
Mud Wt	8.4#/gal	Helper	Riley
Mud Vis	45 sec.	Helper	
Mud pH	9.0	Night Shift-	
Mud Temp(F):IN	73 OUT N/R	Driller	LaOrange
LC. @		Helper	K.K.
		Helper	Hanson
		Foreman	Gillespie
Bits:		Drilling Mgr	Deymonaz

Additional Information: CORE WITH HQ FROM 5,073-5,091 FEET WITHOUT RETURNS. FLUID LEVEL MEASURED WHILE RETRIEVING CORE BARREL REMAINING CONSTANT AT 300-350 FEET. EXTENSIVE SAND INTERVALS BELOW 5,000 FT. CAUSING SOME CAVING AND SQUEEZING. SAND IN TUBE AND BREAK WIRELINE WHILE ATTEMPTING TO RETRIEVE. TRIP OUT OF HOLE, RECOVER CABLE AND TUBE, TRIP IN AND CORE FROM 5,091-5,098 FEET.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 5,098	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	04-23-90
Period Start	0700 4-22-90	Spud Date	12-13-89
Period End	0700 4-23-90	Day #	118
Depth Start	5098 ft.	Contractor/Rig	Tonto/U-5000
Depth End	5152 ft.	Day Shift-	
Footage	54 ft.	Driller	Cunningham
Mud Wt	8.4#/gal	Helper	Riley
Mud Vis	44 sec.	Helper	
Mud pH	9.0	Night Shift-	
Mud Temp(F):IN	72 OUT N/R	Driller	LaOrange
LC. @		Helper	K.K.
		Helper	Hanson
		Foreman	Gillespie
Bits:		Drilling Mgr	Deymonaz

Additional Information: CORE HQ FROM 5,098-5,152 FEET WITHOUT RETURNS. FLUID LEVEL MEASURED WHILE RETRIEVING CORE BARREL REMAINING AT 300-350 FT. SANDY INTERVALS BECOMING LESS FREQUENT BELOW 5,100 FEET, BUT STILL CAUSING SOME CAVING AND SQUEEZING.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 5,152	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	04-24-90
Period Start	0700 4-23-90	Spud Date	12-13-89
Period End	0700 4-24-90	Day #	119
Depth Start	5152 ft.	Contractor/Rig	Tonto/U-5000
Depth End	5211 ft.	Day Shift-	
Footage	59 ft.	Driller	Gillespie
Mud Wt	8.4#/gal	Helper	J.K.
Mud Vis	45 sec.	Helper	
Mud pH	9.0	Night Shift-	
Mud Temp(F):IN	73 OUT N/R	Driller	Cunningham
LC. @		Helper	Riley
		Helper	K.K.
		Foreman	Fierback
Bits:		Drilling Mgr	Deymonaz

Additional Information: CORE WITH HQ FROM 5,152-5,211 FT WITHOUT RETURNS. FLUID LEVEL IN HOLE AT 350 FT. SOME PROBLEMS WITH VIBRATION RESULTING FROM DECREASING BENTONITE IN MUD MIX DURING NIGHT SHIFT, INCREASING BENTONITE AND VIS. ELIMINATED MOST VIBRATION BY END OF SHIFT.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 5,211	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	04-25-90
Period Start	0700 4-24-90	Spud Date	12-13-89
Period End	0700 4-25-90	Day #	120
Depth Start	5211 ft.	Contractor/Rig	Tonto/U-5000
Depth End	5290 ft.	Day Shift-	
Footage	79 ft.	Driller	Gillespie
Mud Wt	8.4#/gal	Helper	J.K.
Mud Vis	47 sec.	Helper	Rose
Mud pH	9.0	Night Shift-	
Mud Temp(F):IN	72 OUT N/A	Driller	Cunningham
LC. @		Helper	Riley
		Helper	K.K.
		Foreman	Fierback
Bits:		Drilling Mgr	Deymonaz

Additional Information: CORE DRILL WITH HQ FROM 5,211-5,290 FT WITHOUT RETURNS. FLUID LEVEL IN HOLE AT 350 FT. BOTTOM HOLE TEMPERATURE SURVEY: 404^{0} (F) AT 5,240 FEET.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 5,290	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	04-26-90
Period Start	0700 4-25-90	Spud Date	12-13-89
Period End	0700 4-26-90	Day #	121
Depth Start	5290 ft.	Contractor/Rig	Tonto/U-5000
Depth End	5290 ft.	Day Shift-	
Footage	0 ft.	Driller	Gillespie
Mud Wt	N/A	Helper	Rose
Mud Vis	N/A	Helper	
Mud pH	N/A	Night Shift-	
Mud Temp(F):IN	N/R OUT N/R	Driller	Cunningham
LC. @		Helper	Riley
		Helper	K.K.
		Foreman	Fierback
Bits:		Drilling Mgr	Deymonaz

Additional Information: SANDY INTERVAL BELOW 5,000 FEET CAVED AND STUCK RODS AT 5,290 FEET. UNABLE TO ROTATE, MOVE RODS OR CIRCULATE, ATTEMPT TO FREE RODS FOR REMAINDER OF THE SHIFT, MOB IN NO RODS AND MAKE UP 5,300 FEET OF RODS IN 30 FOOT LENGTHS.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 5,290	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	04-27-90
Period Start	0700 4-26-90	Spud Date	12-13-89
Period End	0700 4-27-90	Day #	122
Depth Start	5290 ft.	Contractor/Rig	Tonto/U-5000
Depth End	5290 ft.	Day Shift-	
Footage	0 ft.	Driller	Gillespie
Mud Wt	N/R	Helper	Rose
Mud Vis	N/R	Helper	
Mud pH	N/R	Night Shift-	
Mud Temp(F):IN	N/R OUT N/A	Driller	Cunningham
LC. @		Helper	Riley
		Helper	K.K.
		Foreman	Fierback
Bits:	NQ Bit #L-63175 on at 5,290 ft.	Drilling Mgr	Deymonaz

Additional Information: RUN BHT SURVEY AFTER HOLE SAT STATIC FOR FOR 12 HOURS: 442 (F) AT 5,280 FT. REMOVE BOP WHILE PUMPING MUD DOWN ANNULUS. CUT HQ RODS AT WELLHEAD FLANGE AND SECURE PACKER TO HQ RODS (PACKER SEALS HQ - 7 INCH ANNULUS). REINSTALL BOP, TRIP IN NQ RODS WITHOUT BIT, BREAK OFF CROWN ON HQ BIT, CIRCULATE HOLE, TRIP OUT. MAKE UP NQ CORE BARREL AND BIT, TRIP IN HOLE.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 5,290	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	04-28-90
Period Start	0700 4-27-90	Spud Date	12-13-89
Period End	0700 4-28-90	Day #	123
Depth Start	5290 ft.	Contractor/Rig	Tonto/U-5000
Depth End	5332 ft.	Day Shift-	
Footage	42 ft.	Driller	Gillespie
Mud Wt	8.4 #/gal	Helper	Rose
Mud Vis	49 sec.	Helper	
Mud pH	8.0	Night Shift-	
Mud Temp(F):IN	72 OUT N/R	Driller	Cunningham
LC. @	5,322 ft.	Helper	Riley
		Helper	K.K.
		Foreman	Fierback
Bits:		Drilling Mgr	Deymonaz

Additional Information: MILL OUT LANDING RING AND REMAINDER OF HQ BIT, CORE NQ FROM 5,290-5,332 FEET. EXTREMELY HIGH TORQUE SLOWING ROTATION AND PENETRATION. AS CIRCULATION COOLED HQ RODS, THEY CONTRACTED (OR DROPPED) 5 FEET BELOW WELLHEAD ALONG WITH PACKER, ALSO LOST CIRCULATION SHORTLY THEREAFTER. FLUID LEVEL MEASURED DURING CORE RUNS IS AT 500-550 FT.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 5,290	N/A	N/A
3.0"	5290 to 5,332	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	04-29-90
Period Start	0700 4-28-90	Spud Date	12-13-89
Period End	0700 4-29-90	Day #	124
Depth Start	5332 ft.	Contractor/Rig	Tonto/U-5000
Depth End	5402 ft.	Day Shift-	
Footage	70 ft.	Driller	Gillespie
Mud Wt	8.4 #/gal	Helper	Rose
Mud Vis	52 sec.	Helper	
Mud pH	8.0	Night Shift-	
Mud Temp(F): IN	73 OUT N/R	Driller	Cunningham
LC. @		Helper	Riley
		Helper	K.K.
		Foreman	Fierback
Bits:		Drilling Mgr	Deymonaz

Additional Information: CORE NQ FROM 5,332-5,402 FT. WITHOUT RETURNS. ROD TORQUE DECREASED TO NORMAL LEVEL, ROTATION AT 200-300 RPM. FLUID LEVEL MEASURED WHILE RETRIEVING CORE BARREL AT 500-550 FEET. BOTTOM HOLE TEMPERATURE MEASUREMENT OF 434 (F) @ 5,382 FEET MEASURED AT TOP OF OVERSHOT, APPROX. 20 FEET OFF BOTTOM, 30 MINUTES AFTER STOPPING PUMPS.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 5,290	N/A	N/A
3.0"	5290 to 5,402	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	04-30-90
Period Start	0700 4-29-90	Spud Date	12-13-89
Period End	0700 4-30-90	Day #	125
Depth Start	5402 ft.	Contractor/Rig	Tonto/U-5000
Depth End	5482 ft.	Day Shift-	
Footage	80 ft.	Driller	Gillespie
Mud Wt	8.4 #/gal	Helper	Rose
Mud Vis	50 sec.	Helper	
Mud pH	7.5	Night Shift-	
Mud Temp(F):IN	72 OUT N/R	Driller	Cunningham
LC. @		Helper	Riley
		Helper	K.K.
		Foreman	Fierback
Bits:		Drilling Mgr	Deymonaz

Additional Information: CORE NQ FROM 5,402-5,482 FT. WITHOUT RETURNS. FLUID LEVEL MEASURED WHILE RETRIEVING CORE BARREL AT 500-550 FT. BOTTOM HOLE TEMPERATURE MEASUREMENT 20 FEET OFF BOTTOM, 30 MINUTES AFTER STOPPING PUMPS: 438 (F) @ 5,442.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 5,290	N/A	N/A
3.0"	5290 to 5,484	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	05-01-90
Period Start	0700 4-30-90	Spud Date	12-13-89
Period End	0700 5-01-90	Day #	126
Depth Start	5482 ft.	Contractor/Rig	Tonto/U-5000
Depth End	5562 ft.	Day Shift-	
Footage	80 ft.	Driller	Gillespie
Mud Wt	8.4 #/gal	Helper	Rose
Mud Vis	50 sec.	Helper	
Mud pH	7.5	Night Shift-	
Mud Temp(F): IN	73 OUT N/R	Driller	Cunningham
LC. @		Helper	Riley
		Helper	J.K.
		Foreman	Fierback
Bits:		Drilling Mgr	Deymonaz

Additional Information: CORE NQ FROM 5,482-5,562 FT. WITHOUT RETURNS. FLUID LEVEL MEASURED WHILE RETRIEVING CORE BARREL AT 500-550 FT. BOTTOM HOLE TEMPERATURE MEASUREMENT 20 FEET OFF BOTTOM, 30 MINUTES AFTER STOPPING PUMPS: 434 (F) @ 5,502 FT. AND 440 (F) @ 5,552 FT.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 5,290	N/A	N/A
3.0"	5290 to 5,562	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	05-02-90
Period Start	0700 5-01-90	Spud Date	12-13-89
Period End	0700 5-02-90	Day #	127
Depth Start	5562 ft.	Contractor/Rig	Tonto/U-5000
Depth End	5642 ft.	Day Shift-	
Footage	80 ft.	Driller	Gillespie
Mud Wt	8.4 #/gal	Helper	Rose
Mud Vis	49 sec.	Helper	
Mud pH	7.5	Night Shift-	
Mud Temp(F):IN	72 OUT N/A	Driller	Cunningham
LC. @		Helper	Riley
		Helper	J.K.
		Foreman	Fierback
Bits:		Drilling Mgr	Deymonaz

Additional Information: CORE NQ FROM 5,562-5,642 FT. WITHOUT RETURNS. FLUID LEVEL MEASURED WHILE RETRIEVING CORE AT 550 FT. BOTTOM HOLE TEMPERATURE MEASURED 20 FEET OFF BOTTOM, 30 MINUTES AFTER PUMPS STOPPED: 448 (F) @ 5,602 FT.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 5,290	N/A	N/A
3.0"	5290 to 5,642	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	05-03-90
Period Start	0700 5-02-90	Spud Date	12-13-89
Period End	0700 5-03-90	Day #	128
Depth Start	5642 ft.	Contractor/Rig	Tonto/U-5000
Depth End	5672 ft.	Day Shift-	
Footage	30 ft.	Driller	Gillespie
Mud Wt	8.4 #/gal	Helper	Rose
Mud Vis	45 sec.	Helper	K.K.
Mud pH	7.5	Night Shift-	
Mud Temp(F): IN	72 OUT N/R	Driller	Cunningham
LC. @		Helper	Riley
		Helper	J.K.
Bits:	NQ bit # L-63178	Foreman	Fierback
	on at 5,648 ft.	Drilling Mgr	Deymonaz

Additional Information: CORE NQ FROM 5,642-5,648 FT. WITHOUT RETURNS. TRIP FOR BIT CHANGE, HAD TO WASH IN BOTTOM 100 FT OF HOLE. CORE NQ FROM 5,648-5,672 FT WITHOUT RETURNS, CONSIDERABLE VIBRATION AND TORQUE SLOWING PENETRATION. FLUID LEVEL MEASURED WHILE RETRIEVING CORE AT 500-550 FT. BOTTOM HOLE TEMPERATURES MEASURED 20 FEET OFF BOTTOM, 30 MINUTES AFTER STOPPING PUMPS: 470 (F) @ 5,662 FT.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 5,290	N/A	N/A
3.0"	5290 to 5,672	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	05-04-90
Period Start	0700 5-03-90	Spud Date	12-13-89
Period End	0700 5-04-90	Day #	129
Depth Start	5672 ft.	Contractor/Rig	Tonto/U-5000
Depth End	5752 ft.	Day Shift-	
Footage	80 ft.	Driller	Gillespie
Mud Wt	8.4 #/gal	Helper	Rose
Mud Vis	55 sec.	Helper	
Mud pH	7.5	Night Shift-	
Mud Temp(F):IN	72 OUT N/A	Driller	Cunningham
LC. @		Helper	K.K.
		Helper	J.K.
Bits:		Foreman	Fierback
		Drilling Mgr	Deymonaz

Additional Information: CORE WITH NQ FROM 5,672-5,752 FT. WITHOUT RETURNS. EXCESSIVE VIBRATION & HIGH TORQUE SLOWING PENETRATION, DROPPING TO NORMAL LEVELS DURING NIGHT SHIFT. FLUID LEVEL MEASURED WHILE RETRIEVING CORE AT 500-550 FT. BOTTOM HOLE TEMP. MEASURED 20 FT OFF BOTTOM 30 MINUTES AFTER PUMPS STOPPED: 462(F) AT 5,702 FT. AND 462 (F) AT 5,752 FT.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 5,290	N/A	N/A
3.0"	5290 to 5,752	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	05-05-90
Period Start	0700 5-04-90	Spud Date	12-13-89
Period End	0700 5-05-90	Day #	130
Depth Start	5752 ft.	Contractor/Rig	Tonto/U-5000
Depth End	5822 ft.	Day Shift-	
Footage	70 ft.	Driller	Gillespie
Mud Wt	8.4 #/gal	Helper	Rose
Mud Vis	50 sec.	Helper	
Mud pH	7.5	Night Shift-	
Mud Temp(F): IN	72 OUT N/R	Driller	Cunningham
LC. @		Helper	Riley
		Helper	J.K.
Bits:		Foreman	Fierback
		Drilling Mgr	Deymonaz

Additional Information: CORE NQ FROM 5,752-5,822 FT. WITHOUT RETURNS. FLUID LEVEL MEASURED WHILE RETRIEVING CORE AT 400-550 FT. BOTTOM HOLE TEMPERATURES MEASURED 20 FT OFF BOTTOM 30 MINUTES AFTER STOPPING PUMPS: 470 (F) AT 5,802 FEET.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 5,290	N/A	N/A
3.0"	5290 to 5,822	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	05-06-90
Period Start	0700 5-05-90	Spud Date	12-13-89
Period End	0700 5-06-90	Day #	131
Depth Start	5822 ft.	Contractor/Rig	Tonto/U-5000
Depth End	5912 ft.	Day Shift-	
Footage	90 ft.	Driller	Gillespie
Mud Wt	8.4 #/gal	Helper	Rose
Mud Vis	52 sec.	Helper	
Mud pH	7.5	Night Shift-	
Mud Temp(F):	IN 72 OUT N/A	Driller	Cunningham
LC. @		Helper	Riley
		Helper	J.K.
Bits:		Foreman	Fierback
		Drilling Mgr	Deymonaz

Additional Information: CORE WITH NQ FROM 5,822-5,912 FT WITHOUT RETURNS. INTERMITTENT PERIODS OF EXCESSIVE VIBRATION AND HIGH TORQUE SLOWING PENETRATION. FLUID LEVEL MEASURED WHILE RETRIEVING CORE AT 350-450 FT & MINOR RETURNS (TRICKLE) WHILE DRILLING. BOTTOM HOLE TEMPERATURE MEASURED 20 FEET OFF BOTTOM 30 MINUTES AFTER PUMP STOPPED: 482 (F) AT 5,852 FT. & 480 (F) AT 5,902 FT.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 5,290	N/A	N/A
3.0"	5290 to 5,912	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	05-07-90
Period Start	0700 5-06-90	Spud Date	12-13-89
Period End	0700 5-07-90	Day #	132
Depth Start	5912 ft.	Contractor/Rig	Tonto/U-5000
Depth End	5979 ft.	Day Shift-	
Footage	67 ft.	Driller	Gillespie
Mud Wt	8.4 #/gal	Helper	Rose
Mud Vis	54 sec.	Helper	
Mud pH	7.5	Night Shift-	
Mud Temp(F):IN	72 OUT N/R	Driller	Cunningham
LC. @		Helper	Riley
		Helper	K.K.
Bits:		Foreman	Fierback
		Drilling Mgr	Deymonaz

Additional Information: DRILL NQ 5,912-5,979 FT WITH INTERMITTENT MINOR RETURNS. FLUID LEVEL MEASURED DURING CORE RUNS IS AT 350-400 FEET. EXCESSIVE VIBRATION AND TORQUE SLOWING PENETRATION. BOTTOM HOLE TEMPERATURE MEASURED APPROXIMATELY 20 FEET OFF BOTTOM 30 MINUTES AFTER STOPPING PUMPS: 484 (F) AT 5,949 FEET.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 5,290	N/A	N/A
3.0"	5290 to 5,979	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	05-08-90
Period Start	0700 5-07-90	Spud Date	12-13-89
Period End	0700 5-08-90	Day #	133
Depth Start	5979 ft.	Contractor/Rig	Tonto/U-5000
Depth End	6039 ft.	Day Shift-	
Footage	60 ft.	Driller	LaOrange
Mud Wt	8.4 #/gal	Helper	Hanson
Mud Vis	52 sec.	Helper	J.K.
Mud pH	8.0	Night Shift-	
Mud Temp(F): IN	73 OUT 74	Driller	Gillespie
LC. @		Helper	Rose
		Helper	K.K.
Bits:		Foreman	Fierback
		Drilling Mgr	Deymonaz

Additional Information: CORE NO FROM 5,979-6,039 FT. WITH MINOR RETURNS. CONTINUING PROBLEMS WITH EXCESSIVE TORQUE DUE TO BREAK DOWN OF POLYMER MUDS IN HIGH TEMPERATURE ENVIRONMENT. FLUID LEVEL MEASURED WHILE RETRIEVING CORE BARREL AT 350-400 FEET. BOTTOM HOLE TEMPERATURE MEASUREMENT OF 484 (F) AT 5,997 FEET MEASURED AT TOP OF OVERSHOT, APPROXIMATELY 20 FEET OFF BOTTOM, 30 MINUTES AFTER STOPPING PUMPS.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 5,290	N/A	N/A
3.0"	5290 to 6,039	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	05-09-90
Period Start	0700 5-08-90	Spud Date	12-13-89
Period End	0700 5-09-90	Day #	134
Depth Start	6039 ft.	Contractor/Rig	Tonto/U-5000
Depth End	6113 ft.	Day Shift-	
Footage	74 ft.	Driller	LaOrange
Mud Wt	8.4 #/gal	Helper	Hanson
Mud Vis	56 sec.	Helper	J.K.
Mud pH	7.5	Night Shift-	
Mud Temp(F): IN	72 OUT 74	Driller	Gillespie
LC. @		Helper	Rose
		Helper	K.K.
Bits:		Foreman	Fierback
		Drilling Mgr	Deymonaz

Additional Information: CORE NQ FROM 6,039-6,113 FT. WITH MINOR RETURNS. FLUID LEVEL MEASURED WHILE RETRIEVING CORE BARREL AT 300-350 FEET. BOTTOM HOLE TEMPERATURE MEASUREMENT 20 FT. OFF BOTTOM, 30 MINUTES AFTER STOPPING PUMPS: 490 (F) AT 6,048 FT. AND 498 (F) AT 6,102 FEET.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 5,290	N/A	N/A
3.0"	5290 to 6,113	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	05-10-90
Period Start	0700 5-09-90	Spud Date	12-13-89
Period End	0700 5-10-90	Day #	135
Depth Start	6113 ft.	Contractor/Rig	Tonto/U-5000
Depth End	6158 ft.	Day Shift-	
Footage	45 ft.	Driller	LaOrange
Mud Wt	8.4 #/gal	Helper	Hanson
Mud Vis	56 sec.	Helper	J.K.
Mud pH	8.0	Night Shift-	
Mud Temp(F): IN	72 OUT 74	Driller	Gillespie
LC. @		Helper	Rose
		Helper	K.K.
Bits:		Foreman	Fierback
		Drilling Mgr	Deymonaz

Additional Information: CORE NQ FROM 6,113-6,158 FEET WITH 20% RETURNS. FORMATION EXTREMELY BROKEN W/ SOME POORLY CONSOLIDATED SAND INTERVALS RESULTING IN SHORT RUNS. FLUID LEVEL MEASURED WHILE RETRIEVING CORE BARREL AT 300-350 FEET. BOTTOM HOLE TEMPERATURE MEASURED 20 FT OFF BOTTOM, 30 MINUTES AFTER STOPPING PUMPS: 514 (F) AT 6,154 FEET.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 5,290	N/A	N/A
3.0"	5290 to 6,158	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	05-11-90
Period Start	0700 5-10-90	Spud Date	12-13-89
Period End	0700 5-11-90	Day #	136
Depth Start	6158 ft.	Contractor/Rig	Tonto/U-5000
Depth End	6222 ft.	Day Shift-	
Footage	64 ft.	Driller	LaOrange
Mud Wt	8.4 #/gal	Helper	Hanson
Mud Vis	55 sec.	Helper	J.K.
Mud pH	7.5	Night Shift-	
Mud Temp(F):IN	72 OUT 74	Driller	Gillespie
LC. @		Helper	Rose
		Helper	K.K.
Bits:		Foreman	Fierback
		Drilling Mgr	Deymonaz

Additional Information: CORE WITH NQ FROM 6,158-6,222 FT WITH 20% RETURNS. EXTREMELY BROKEN RESULTING IN SHORT RUNS, BECOMING MORE COMPETENT BELOW 6,180 FT. FLUID LEVEL MEASURED WHILE RETRIEVING CORE AT 300-350 FEET. BOTTOM HOLE TEMPERATURE MEASURED 20 FT OFF BOTTOM, 30 MINUTES AFTER PUMPS STOPPED: 522 (F) AT 6,202 FEET.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 5,290	N/A	N/A
3.0"	5290 to 6,222	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	05-12-90
Period Start	0700 5-11-90	Spud Date	12-13-89
Period End	0700 5-12-90	Day #	137
Depth Start	6222 ft.	Contractor/Rig	Tonto/U-5000
Depth End	6296 ft.	Day Shift-	
Footage	74 ft.	Driller	LaOrange
Mud Wt	8.4 #/gal	Helper	Hanson
Mud Vis	56 sec.	Helper	J.K.
Mud pH	8.5	Night Shift-	
Mud Temp(F):	IN 72 OUT 74	Driller	Gillespie
LC. @		Helper	Rose
		Helper	K.K.
Bits:		Foreman	Fierback
		Drilling Mgr	Deymonaz

Additional Information: CORE NQ FROM 6,222-6,296 FT. WITH 10-20% RETURNS. FLUID LEVEL MEASURED WHILE RETRIEVING CORE AT 300-400 FT. LAST 2 HIGH RANGE MAXIMUM READING THERMOMETERS BROKEN, NO FURTHER BOTTOM HOLE MEASUREMENTS UNTIL HOLE IS COMPLETED AT APPROXIMATELY 6,500 FEET.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 5,290	N/A	N/A
3.0"	5290 to 6,296	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	05-13-90
Period Start	0700 5-12-90	Spud Date	12-13-89
Period End	0700 5-13-90	Day #	138
Depth Start	6296 ft.	Contractor/Rig	Tonto/U-5000
Depth End	6367 ft.	Day Shift-	
Footage	71 ft.	Driller	LaOrange
Mud Wt	8.4 #/gal	Helper	Hanson
Mud Vis	55 sec.	Helper	J.K.
Mud pH	8.0	Night Shift-	
Mud Temp(F):	IN 72 OUT 75	Driller	Gillespie
LC. @		Helper	Rose
		Helper	K.K.
Bits:		Foreman	Fierback
		Drilling Mgr	Deymonaz

Additional Information: CORE WITH NQ FROM 6,296-6,367 FT. WITH 10-20% RETURNS. FLUID LEVEL MEASURED WHILE RETRIEVING CORE AT 300-350 FEET.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 5,290	N/A	N/A
3.0"	5290 to 6,367	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	05-14-90
Period Start	0700 5-13-90	Spud Date	12-13-89
Period End	0700 5-14-90	Day #	139
Depth Start	6367 ft.	Contractor/Rig	Tonto/U-5000
Depth End	6402 ft.	Day Shift-	
Footage	35 ft.	Driller	LaOrange
Mud Wt	8.4 #/gal	Helper	Hanson
Mud Vis	54 sec.	Helper	J.K.
Mud pH	7.5	Night Shift-	
Mud Temp(F): IN	72 OUT 75	Driller	Gillespie
LC. @		Helper	Rose
		Helper	K.K.
Bits:		Foreman	Fierback
		Drilling Mgr	Deymonaz

Additional Information: DRILL NQ 6,367-6,402 FT WITH 10-20% RETURNS. FLUID LEVEL MEASURED DURING CORE RUNS IS AT 350-400 FEET. TRIP FOR BIT AT 6,402 FEET.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 5,290	N/A	N/A
3.0"	5290 to 6,402	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-4
Period Start 0700 5-14-90
Period End 0700 5-15-90
Depth Start 6402 ft.
Depth End 6469 ft.
Footage 67 ft.
Mud Wt 8.4 #/gal
Mud Vis 55 sec.
Mud pH 8.5
Mud Temp(F):IN 72 OUT 75
LC. @
Bits:

Date 05-15-90
Spud Date 12-13-89
Day # 140
Contractor/Rig Tonto/U-5000
Day Shift-
Driller LaOrange
Helper Hanson
Helper J.K.
Night Shift-
Driller Gillespie
Helper Rose
Helper K.K.
Foreman Fierback
Drilling Mgr Deymonaz

Additional Information: CORE NQ FROM 6,402-6,469 FT. WITH 20% RETURNS. FLUID LEVEL MEASURED WHILE RETRIEVING CORE AT 300-400 FEET.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 5,290	N/A	N/A
3.0"	5290 to 6,469	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	05-16-90
Period Start	0700 5-15-90	Spud Date	12-13-89
Period End	0700 5-16-90	Day #	141
Depth Start	6469 ft.	Contractor/Rig	Tonto/U-5000
Depth End	6552 ft.	Day Shift-	
Footage	83 ft.	Driller	LaOrange
Mud Wt	8.4 #/gal	Helper	Hanson
Mud Vis	55 sec.	Helper	J.K.
Mud pH	8.0	Night Shift-	
Mud Temp(F):IN	72 OUT 75	Driller	Gillespie
LC. @		Helper	Rose
		Helper	K.K.
Bits:		Foreman	Fierback
		Drilling Mgr	Deymonaz

Additional Information: CORE WITH NQ FROM 6,469-6,552 FT. WITH 20% RETURNS. FLUID LEVEL MEASURED WHILE RETRIEVING CORE @ 300-350 FEET.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 5,290	N/A	N/A
3.0"	5290 to 6,552	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	05-17-90
Period Start	0700 5-16-90	Spud Date	12-13-89
Period End	0700 5-17-90	Day #	142
Depth Start	6552 ft.	Contractor/Rig	Tonto/U-5000
Depth End	6562 ft.	Day Shift-	
Footage	10 ft.	Driller	LaOrange
Mud Wt	8.4 #/gal	Helper	Hanson
Mud Vis	54 sec.	Helper	J.K.
Mud pH	8.5	Night Shift-	
Mud Temp(F): IN	72 OUT 75	Driller	Gillespie
LC. @		Helper	Rose
		Helper	K.K.
Bits:		Foreman	Fierback
		Drilling Mgr	Deymonaz

Additional Information: DRILL NQ 6,552-6,565 FT WITH 20% RETURNS. FLUID LEVEL MEASURED DURING CORE RUNS IS AT 350 FEET. RUN 2.5 HOUR TIME-TEMPERATURE SURVEY 16 FEET OFF BOTTOM WITH KUSTER TOOL. HIGHEST RECORDED TEMPERATURE 3 HOURS 25 MINUTES AFTER STOPPING PUMPS WAS 563(F) WITH CONTINUING SLOW TEMPERATURE INCREASE. TRIP OUT NQ RODS AND STAND BACK. TRIP IN HOLE WITH TAP AND WORK HQ RODS LOOSE, BEGIN TRIPPING OUT AND LAYING DOWN SINGLES.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 5,290	N/A	N/A
3.0"	5290 to 6,562	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-4
Period Start 0700 5-17-90
Period End 0700 5-18-90
Depth Start 6562 ft.
Depth End 6562 ft.
Footage 0 ft.
Mud Wt N/A
Mud Vis N/A
Mud pH N/A
Mud Temp(F):IN N/A OUT N/A
LC. @
Bits:

Date 05-18-90
Spud Date 12-13-89
Day # 143
Contractor/Rig Tonto/U-5000
Day Shift-
Driller LaOrange
Helper Hanson
Helper J.K.
Night Shift-
Driller Gillespie
Helper Rose
Helper K.K
Foreman Fierback
Drilling Mgr Deymonaz

Additional Information: TRIP OUT HQ RODS AND LAY DOWN SINGLES. PIPE BACKED OFF AT 4,630 FEET, 760 FEET REMAIN IN HOLE (4,570-5,330 FEET), AND HAVE WORKED DOWN TO 5,330 FEET. RODS WILL BE LEFT IN HOLE TO CONTAIN UNSTABLE SANDY AREA BETWEEN 5,000 AND 5,200 FEET. BEGIN PULLING 4-1/2 INCH CASING SLEEVE.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 5,290	N/A	N/A
3.0"	5290 to 6,562	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	05-19-90
Period Start	0700 5-18-90	Spud Date	12-13-89
Period End	0700 5-19-90	Day #	144
Depth Start	6562 ft.	Contractor/Rig	Tonto/U-5000
Depth End	6562 ft.	Day Shift-	
Footage	0 ft.	Driller	LaOrange
Mud Wt	N/A	Helper	Hanson
Mud Vis	N/A	Helper	J.K.
Mud pH	N/A	Night Shift-	
Mud Temp(F):IN	N/A OUT N/A	Driller	Gillespie
LC. @		Helper	Rose
		Helper	K.K.
Bits:		Foreman	Fierback
		Drilling Mgr	Deymonaz

Additional Information: BREAK OUT NQ RODS, LAY DOWN CORE BARREL, RUN IN HOLE OPENENDED TO TD, CIRCULATE HOLE FOR 1 HOUR, BEGIN BREAKING OUT NQ AND LAYING DOWN DOUBLES (20 FT).

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 5,290	N/A	N/A
3.0"	5290 to 6,562	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-4
Period Start 0700 5-19-90
Period End 0700 5-20-90
Depth Start 6562 ft.
Depth End 6562 ft.
Footage 0 ft.
Mud Wt N/A
Mud Vis N/A
Mud pH N/A
Mud Temp(F):IN N/A OUT N/A
LC. @
Bits:

Date 05-20-90
Spud Date 12-13-89
Day # 145
Contractor/Rig Tonto/U-5000
Day Shift-
Driller LaOrange
Helper Hanson
Helper J.K.
Night Shift-
Driller Gillespie
Helper Rose
Helper K.K.
Foreman Fierback
Drilling Mgr Deymonaz

Additional Information: BREAK OUT REMAINDER OF NQ RODS AND LAY DOWN IN DOUBLES (20 FT.). MAKE UP PERFORATED NQ TUBING & BEGIN RUNNING IN HOLE.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 5,290	N/A	N/A
3.0"	5290 to 6,562	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	05-21-90
Period Start	0700 5-20-90	Spud Date	12-13-89
Period End	0700 5-21-90	Day #	146
Depth Start	6562 ft.	Contractor/Rig	Tonto/U-5000
Depth End	6562 ft.	Day Shift-	
Footage	0 ft.	Driller	LaOrange
Mud Wt	N/A	Helper	Hanson
Mud Vis	N/A	Helper	J.K.
Mud pH	N/A	Night Shift-	
Mud Temp(F):IN	N/A OUT N/A	Driller	Gillespie
LC. @		Helper	Rose
		Helper	K.K.
Bits:		Foreman	Fierback
		Drilling Mgr	Deymonaz

Additional Information: FINISH RUNNING NQ TUBING TO TD, PICK UP 5 FT. OFF BOTTOM AND HANG IN FOOT CLAMP. RIG UP LOGGING TRUCK (HOT HOLE INSTRUMENTS, INC.) RUN TEMPERATURE SURVEY, TOOL FAILED AT 4,100 FT. REPLACEMENT PARTS ARE SCHEDULED IN @ 2 PM (5-21-90) AND ANOTHER ATTEMPT WILL BE MADE TO RUN TEMPERATURE SURVEY. RUN SPINNER SURVEY WHILE PUMPING APPROXIMATELY 30 GPM DOWN TUBING. RIG DOWN LOGGERS, REMOVE BOP EQUIPMENT, PREPARE FOR TEMP-PRESSURE SURVEY WITH KUSTER EQUIPMENT.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 5,290	N/A	N/A
3.0"	5290 to 6,562	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	05-22-90
Period Start	0700 5-21-90	Spud Date	12-13-89
Period End	0700 5-22-90	Day #	147
Depth Start	6562 ft.	Contractor/Rig	Tonto/U-5000
Depth End	6562 ft.	Day Shift-	
Footage	0 ft.	Driller	LaOrange
Mud Wt	N/A	Helper	Hanson
Mud Vis	N/A	Helper	J.K.
Mud pH	N/A	Night Shift-	
Mud Temp(F):IN	N/A OUT N/A	Driller	Cunningham
LC. @		Helper	Riley
		Helper	K.K.
Bits:		Foreman	Fierback
		Drilling Mgr	Deymonaz

Additional Information: RUN TEMPERATURE-PRESSURE SURVEY WITH KUSTER TOOLS WHILE INJECTING WATER INTO HOLE. RIG COMPLETION WELLHEAD. RUN ADDITIONAL TEMPERATURE-PRESSURE SURVEYS.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 5,290	N/A	N/A
3.0"	5290 to 6,562	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	05-23-90
Period Start	0700 5-22-90	Spud Date	12-13-89
Period End	0700 5-23-90	Day #	148
Depth Start	6562 ft.	Contractor/Rig	Tonto/U-5000
Depth End	6562 ft.	Day Shift-	
Footage	0 ft.	Driller	LaOrange
Mud Wt	N/A	Helper	Hanson
Mud Vis	N/A	Helper	J.K.
Mud pH	N/A	Night Shift-	
Mud Temp(F):IN	N/A OUT N/A	Driller	Cunningham
LC. @		Helper	Riley
		Helper	K.K.
Bits:		Foreman	Fierback
		Drilling Mgr	Deymonaz

Additional Information: CONTINUE TEMPERATURE-PRESSURE SURVEYS AND HOT HOLE INSTRUMENTS, INC. SET UP AND RAN TEMPERATURE PROFILE.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 5,290	N/A	N/A
3.0"	5290 to 6,562	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-4
Period Start 0700 5-23-90
Period End 0700 5-24-90
Depth Start 6562 ft.
Depth End 6562 ft.
Footage 0 ft.
Mud Wt N/A
Mud Vis N/A
Mud pH N/A
Mud Temp(F):IN N/A OUT N/A
LC. @
Bits:

Date 05-24-90
Spud Date 12-13-89
Day # 149
Contractor/Rig Tonto/U-5000
Day Shift-
Driller LaOrange
Helper Hanson
Helper J.K.
Night Shift-
Driller Cunningham
Helper Riley
Helper K.K.
Foreman Fierback
Drilling Mgr Deymonaz

Additional Information: RUN TEMPERATURE-PRESSURE SURVEYS AND RIG DOWN EQUIPMENT.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 5,290	N/A	N/A
3.0"	5290 to 6,562	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	05-25-90
Period Start	0700 5-24-90	Spud Date	12-13-89
Period End	0700 5-25-90	Day #	150
Depth Start	6562 ft.	Contractor/Rig	Tonto/U-5000
Depth End	6562 ft.	Day Shift-	
Footage	0 ft.	Driller	LaOrange
Mud Wt	N/A	Helper	Hanson
Mud Vis	N/A	Helper	J.K.
Mud pH	N/A	Night Shift-	
Mud Temp(F):IN	N/A OUT N/A	Driller	Cunningham
LC. @		Helper	Riley
		Helper	K.K.
Bits:		Foreman	Fierback
		Drilling Mgr	Deymonaz

Additional Information: RIG DOWN, MOVE EQUIPMENT OFF LOCATION.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 5,290	N/A	N/A
3.0"	5290 to 6,562	N/A	N/A

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-4	Date	05-26-90
Period Start	0700 5-25-90	Spud Date	12-13-89
Period End	0700 5-26-90	Day #	151
Depth Start	6562 ft.	Contractor/Rig	Tonto/U-5000
Depth End	6562 ft.	Day Shift-	
Footage	0 ft.	Driller	LaOrange
Mud Wt	N/A	Helper	Hanson
Mud Vis	N/A	Helper	J.K.
Mud pH	N/A	Night Shift-	
Mud Temp(F):IN	N/A OUT N/A	Driller	Cunningham
LC. @		Helper	Riley
		Helper	K.K.
Bits:		Foreman	Fierback
		Drilling Mgr	Deymonaz

Additional Information: RIG DOWN AND MOVE EQUIPMENT OFF LOCATION. LAST DAY OF OPERATIONS ON SOH-4.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
17-1/2"	0 to 121	13-3/8" (0-121)	K-55/61#
12 1/4"	121 to 992	9-5/8" (0-990)	K-55/40#
8 1/2"	992 to 2,000	7" (0-1,999)	L-80/35#
3.8"	2000 to 5,290	N/A	N/A
3.0"	5290 to 6,562	N/A	N/A

APPENDIX B

COMPLAINT LOGS AND RESPONSE -- SOH 4

bc: HO
DT
JP
DM

Public Contact Sheet

First Contact: answering service 0
mobile phone 0
walk-in 0 ✓ to Steve Avery's
other 0 Specify-

Date 4-3-90 Time Unspecified

Nature of contact: request for information 0
complaint call 0 ✓

Residents name: Edla Chory
address : Box 271 Curtistown 96760
phone number : No phone

Contacted by, _____ Date 4-3-90 time —

Remarks:

Resident complained to Mrs. Avery about noise, and that no one ever answered, or did anything about her complaints.

Action taken:

Steve relayed complaint to me —

I told John Deymonaz about Ms. Chory's visit to Avery house. spoke to him 4-4-90 he had a meeting scheduled with her that same day.

For: SOH

J. Deymonaz
A. Seki

initiated by R. Kocay

date 4-4-90

Public Contact Sheet

First Contact: answering service 0 ✓ to mobile number
mobile phone 0
walk-in 0
other 0 Specify-

Date 4-27-90 Time 2 pm

Nature of contact: request for information 0
complaint call 0 ✓

Residents name: Edla Chony
address : Box 271 Curtistown 96760
phone number : No phone

Contacted by, R. Kochy Date Same time

Remarks:

Resident complained of noise previous two nights. Asked me to find out what was going and advise her with written info sent to her P.O. Box. She stated engine was "revving"

Action taken:

Had Steve Avery check with SOH operations – Tripping on days of complaint. Requested additional nighttime noise monitoring from Steve; advised J. Deymonaz 0700 4-28-90 of call and Ms. Chony's request for Reports from J.D.
Resident request copy of complaint forewarded to her, also forewarded copy of her 4-3-90 visit to Avery house.

For: SOH.

J. Deymonaz
A. Seki

initiated by R. Kochy
date 4-28-90

Public Contact Sheet

First Contact: answering service X to mobile phone
mobile phone 0
walk-in 0
other 0 Specify-

Date 5-13-90 Time 1545

Nature of contact: request for information 0
complaint call ✓

Residents name: Edla Chony
address : Box 271 Curtistown 96760
phone number : N.P.

Contacted by, R. Kochy Date same as above time

Remarks:

Resident Complained of trucks on Road before 7Am

Action taken:

Called John Daymonaz, he had spoken to resident earlier watenhaulers arrived before 7am to avoid protestors.

For:

Scientific observation Hole project

initiated by R. Kochy

date 5-31-90

Copy to Resident

APPENDIX C

NOISE COMPLAINT ANALYSIS -- SOH 4

DARBY ACOUSTICAL CONSULTANTS, LTD.
dba
DARBY
& ASSOCIATES
ACOUSTICAL CONSULTANTS

bc: HO
DT
JD

#89-10
June 12, 1990

Mr. Art Seki
University of Hawaii
Hawaii Natural Energy Institute
2540 Dole St., Holmes Hall #206
Honolulu, Hawaii 96822

Subject: Noise Complaint Evaluations in April, SOH #4 - SOH Program, Puna, Hawaii

Dear Mr. Seki:

Our report dated April 10, 1990 provided a summary of noise level data recorded from January 6, 1990 to March 30, 1990. Two automatic noise monitoring stations have been in operation since March 30, 1990, and also selected manual noise level measurements have been made by Steve Avery. A summary report is forthwith coming. This letter represents a response to two specific noise complaints by Ms. Edla "Carrie" Chory:

1. Noise Complaint on April 3, 1990 - No specific time of day or nature of the noise is provided on the "Public contact Sheet." Review of the noise level record from the monitoring station at SOH #4 on April 2nd and 3rd indicates that the noise levels were below 70 dBA except for a few transient events that went to the low 70's. Review of the Daily Drilling Reports for those two days did not show any unusual problems. Review of the meteorological data from SOH #4 indicates that there was very little rain on those two days and that the noise source was never upwind of the listener. Most of the time the noise source was downwind, but for some periods there was a transitional condition where there was

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KAILUA, HAWAII 96734 • (808) 254-3318 • FAX (808) 254-5295

a chance of stronger sound propagation and some of the few transient events may have been audible. However, in consideration of all of the above factors, there is no evidence that the Geothermal Noise Guidelines would have been exceeded.

2. Noise Complaint on April 27, 1990 - The Public Contact Sheet dated April 27, 1990 states "the resident complained of noise previous two nights...she stated engine was 'revving.'" The Daily Drilling Report dated April 26, 1990 states that between 7 am on April 26, 1990 and 7 am on April 27, 1990 there was both "trip-out" and "trip-in-hole." The noise level chart for that time period shows continuous, repetitive, transient noises from about 11 am to 5 pm on April 26, 1990 which is assumed to be the trip-out; and again from about 11 pm to 8 am, assumed to be the trip-in. The latter event had two quiet periods totalling about 2 hours. The noise level peaks during these events were typically about 72 dBA. The meteorological data show that during the daytime trip-out, the wind was from the ESE or in a transitional condition with respect to the extremes of sound propagation. However, during the nighttime trip-in, the wind was from the SSW at about 2 mph and the noise source was upwind of the listener. There was no rainfall recorded during the trip-in period. Thus, during trip-in, there is a good possibility that strong sound propagation conditions existed and the complainant readily could hear repeated "revving" of the engine. At the 3,900 foot separation distance with propagation Condition No. 1 in effect, instantaneous peak noise levels at the listener theoretically

could have ranged from 39 to 49 dBA. Though the noise was considered intrusive for this combination of a noisy event and strong propagation conditions, it is believed that while the Geothermal Noise Guideline limits may have been approached, they probably were not exceeded when one takes into account the "10% of the time in any 20 minute period" condition and the allowance for "impact" noise.

Sincerely,

Ronald A. Darby, P.E.

RAD/ld

APPENDIX D

DAILY DRILLING REPORTS -- SOH 1

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
Period Start 0700 5-26-90
Period End 0700 5-27-90
Depth Start 0 ft.
Depth End 0 ft.
Footage 0 ft.
Mud Wt N/A
Mud Vis N/A
Mud pH N/A
Mud Temp(F): IN N/A OUT N/A
LC. @
Bits:

Date 05-27-90
Spud Date
Day # A
Contractor/Rig Tonto/U-5000
Day Shift-
Driller LaOrange
Helper Hanson
Helper J.K.
Night Shift-
Driller Cunningham
Helper Riley
Helper K.K.
Foreman Fierback
Drilling Mgr Deymonaz

Additional Information: MOVE EQUIPMENT TO SITE AND SET UP. INSTALL WATER LINE.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
	to		
	to		
	to		
	to		
	to		

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
Period Start 0700 5-27-90
Period End 0700 5-28-90
Depth Start 0
Depth End 0
Footage 0 ft.
Mud Wt N/A
Mud Vis N/A
Mud pH N/A
Mud Temp(F):IN N/A OUT N/A
LC. @
Bits:

Date 05-28-90
Spud Date
Day # B
Contractor/Rig Tonto/U-5000
Day Shift-
Driller LaOrange
Helper Hanson
Helper J.K.
Night Shift-
Driller Cunningham
Helper Riley
Helper K.K.
Foreman Fierback
Drilling Mgr Deymonaz

Additional Information: MOVE EQUIPMENT AND SET UP. INSTALL ADDITIONAL SOUND PROOFING TO MAIN WENCH, LINE SUMP WITH CINDER BEGIN JACKING UP RIG.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
	to		
	to		
	to		
	to		
	to		

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
Period Start 0700 5-28-90
Period End 0700 5-29-90
Depth Start 0
Depth End 0
Footage 0 ft.
Mud Wt N/A
Mud Vis N/A
Mud pH N/A
Mud Temp(F): IN N/A OUT N/A
LC. @
Bits:

Date 05-29-90
Spud Date
Day # C
Contractor/Rig Tonto/U-5000
Day Shift-
Driller LaOrange
Helper Hanson
Helper J.K.
Night Shift-
Driller Cunningham
Helper Riley
Helper K.K.
Foreman Fierback
Drilling Mgr Deymonaz

Additional Information: RIG UP EQUIPMENT, SET GUY WIRES, BUILD GATE AND SET SUBSTRUCTURE.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
	to		
	to		
	to		
	to		
	to		

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
Period Start 0700 5-29-90
Period End 0700 5-30-90
Depth Start 0
Depth End 0
Footage 0 ft.
Mud Wt N/A
Mud Vis N/A
Mud pH N/A
Mud Temp(F):IN N/A OUT N/A
LC. @
Bits:

Date 05-30-90
Spud Date
Day # D
Contractor/Rig Tonto/U-5000
Day Shift-
Driller LaOrange
Helper Hanson
Helper J.K.
Night Shift-
Driller Cunningham
Helper Riley
Helper K.K.
Foreman Fierback
Drilling Mgr Deymonaz

Additional Information: SET UP EQUIPMENT.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
	to		
	to		
	to		
	to		
	to		

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
Period Start 0700 5-30-90
Period End 0700 5-31-90
Depth Start 0
Depth End 0
Footage 0 ft.
Mud Wt N/A
Mud Vis N/A
Mud pH N/A
Mud Temp(F): IN N/A OUT N/A
LC. @
Bits:

Date 05-31-90
Spud Date
Day # E
Contractor/Rig Tonto/U-5000
Day Shift-
Driller LaOrange
Helper Hanson
Helper J.K.
Night Shift-
Driller Cunningham
Helper Riley
Helper K.K.
Foreman Fierback
Drilling Mgr Deymonaz

Additional Information: SET UP EQUIPMENT, MOVE IN WATER TANK, TRUCK IN MUDS AND CONTAINERS.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
	to		
	to		
	to		
	to		
	to		

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
Period Start 0700 5-31-90
Period End 0700 6-01-90
Depth Start 0 ft.
Depth End 122 ft.
Footage 122 ft.
Mud Wt 8.4 #/gal
Mud Vis 42 sec
Mud pH 10.5
Mud Temp(F):IN 73 OUT N/R
LC. @
Bits: CHD-101 #EK17700-3 on at 0 ft.

Date 06-01-90
Spud Date 06-01-90
Day # 1
Contractor/Rig Tonto/U-5000
Day Shift-
Driller LaOrange
Helper J.K.
Helper Hanson
Night Shift-
Driller Cunningham
Helper K.K.
Helper Riley
Foreman Fierback
Drilling Mgr Deymonaz

Additional Information: INSTALL SUMP LINER, FINISH RIGGING UP, MIX MUD AND SPUD IN WITH 101mm CORE AT 2 PM. CORE FROM SURFACE TO 122 FT. LOSE RETURNS AT 25 FEET. ROCK CONSISTING OF THICK (OVER 30 FT.), COMPETENT BASALT FLOWS.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
4"	0 to 122	N/A	N/A
	to		
	to		
	to		
	to		

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-1	Date	06-02-90
Period Start	0700 6-01-90	Spud Date	06-01-90
Period End	0700 6-02-90	Day #	2
Depth Start	122 ft.	Contractor/Rig	Tonto/U-5000
Depth End	202 ft.	Day Shift-	
Footage	80 ft.	Driller	LaOrange
Mud Wt	8.4 #/gal	Helper	Hanson
Mud Vis	39 sec	Helper	J.K.
Mud pH	10.0	Night Shift-	
Mud Temp(F):IN	72 OUT N/A	Driller	Cunningham
LC. @		Helper	Riley
		Helper	K.K.
Bits:	2 3/8" TRICONE #8066	Foreman	Fierback
		Drilling Mgr	Deymonaz

Additional Information: CORE WITH 101mm FROM 122-202 FT. TRIP OUT OF HOLE, PICK UP 12-1/4" BIT AND NEAR BIT STABALIZER, OPEN HOLE TO 30 FT. WITHOUT RETURNS.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
4.0"	30 to 202	N/A	N/A
12.25"	0 to 30	N/A	N/A
	to		
	to		
	to		

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-1	Date	06-03-90
Period Start	0700 6-02-90	Spud Date	06-01-90
Period End	0700 6-03-90	Day #	3
Depth Start	202 ft.	Contractor/Rig	Tonto/U-5000
Depth End	202 ft.	Day Shift-	
Footage	Reaming	Driller	LaOrange
Mud Wt	8.4 #/gal	Helper	Hanson
Mud Vis	44 sec	Helper	J.K.
Mud pH	10.5	Night Shift-	
Mud Temp(F):IN	72 OUT N/A	Driller	Cunningham
LC. @		Helper	Riley
		Helper	K.K.
Bits:		Foreman	Fierback
		Drilling Mgr	Deymonaz

Additional Information: OPEN 12-1/4" HOLE FROM 30-100 FEET WITHOUT RETURNS.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
4.0"	100 to 202	N/A	N/A
12.25"	0 to 100	N/A	N/A
	to		
	to		
	to		

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
Period Start 0700 6-03-90
Period End 0700 6-04-90
Depth Start 202 ft.
Depth End 202 ft.
Footage Reaming
Mud Wt 8.4 #/gal
Mud Vis 42 sec
Mud pH 10.5
Mud Temp(F):IN 73 OUT N/A
LC. @
Bits:

Date 06-04-90
Spud Date 06-01-90
Day # 4
Contractor/Rig Tonto/U-5000
Day Shift-
Driller LaOrange
Helper J.K.
Helper Hanson
Night Shift-
Driller Cunningham
Helper K.K.
Helper Riley
Foreman Fierback
Drilling Mgr Deymonaz

Additional Information: OPEN 12-1/4" HOLE FROM 100-188 FEET WITHOUT RETURNS.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
4.0"	188 to 122	N/A	N/A
12-1/4"	0 to 188	N/A	N/A
	to		
	to		
	to		

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-1	Date	06-05-90
Period Start	0700 6-04-90	Spud Date	06-01-90
Period End	0700 6-05-90	Day #	5
Depth Start	188 ft.	Contractor/Rig	Tonto/U-5000
Depth End	202 ft.	Day Shift-	
Footage	14 ft.	Driller	LaOrange
Mud Wt	8.4 #/gal	Helper	J.K.
Mud Vis	40 sec	Helper	Hanson
Mud pH	10.5	Night Shift-	
Mud Temp(F):IN	73 OUT N/R	Driller	Cunningham
LC. @		Helper	K.K.
		Helper	Riley
Bits:		Foreman	Fierback
		Drilling Mgr	Deymonaz

Additional Information: OPEN 12-1/4" HOLE FROM 188-202 FEET, CONDITION HOLE, TRIP OUT AND LAY DOWN HOLE OPENER. RUN 9-5/8" CASING TO TD AND CEMENT WITH 5 YARDS OF REDIMIX (5 SACK MIX W/ 1/2" MINUS GRAVEL), APPROXIMATELY 200% OF CALCULATED VOLUME, WITHOUT RETURNS TO SURFACE. WAIT ON CEMENT, PERFORM 3 TOP JOBS WITH NEAT CEMENT USING A TOTAL OF 87 SACKS OF CEMENT.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
4.0"	N/A	N/A	N/A
12.25"	0 to 202	9-5/8" (0-202)	K-55/40#
	to		
	to		
	to		

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
Period Start 0700 6-05-90
Period End 0700 6-06-90
Depth Start 202 ft.
Depth End 202 ft.
Footage 0 ft.
Mud Wt N/A
Mud Vis N/A
Mud pH 10.0
Mud Temp(F):IN N/A OUT N/A
LC. @
Bits:

Date 06-06-90
Spud Date 06-01-90
Day # 6
Contractor/Rig Tonto/U-5000
Day Shift-
Driller LaOrange
Helper Hanson
Helper J.K.
Night Shift-
Driller Cunningham
Helper Riley
Helper
Foreman Fierback
Drilling Mgr Deymonaz

Additional Information: WAIT ON CEMENT, WORK ON ADDITIONAL SOUND PROOFING WALLS. COMPLETE CEMENTING CASING WITH 1.5 YARDS REDIMIX (5 SACK MIX WITH 1/2" MINUS GRAVEL). WAIT ON CEMENT.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
4.0"	N/A	N/A	N/A
12.25"	0 to 202	9-5/8" (0-202)	K-55/40#
	to		
	to		
	to		

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
Period Start 0700 6-06-90
Period End 0700 6-07-90
Depth Start 202 ft.
Depth End 202 ft.
Footage
Mud Wt N/A
Mud Vis N/A
Mud pH N/A
Mud Temp(F):IN N/A OUT N/A
LC. @
Bits:

Date 06-07-90
Spud Date 06-01-90
Day # 7
Contractor/Rig Tonto/U-5000
Day Shift-
Driller LaOrange
Helper Hanson
Helper J.K.
Night Shift-
Driller Cunningham
Helper Riley
Helper
Foreman Gillespie
Drilling Mgr Deymonaz

Additional Information: CUT OFF CASING, WELD ON WELLHEAD, NIPPLE UP 13-3/8" BOP EQUIPMENT, INSTALL 5 INCH SLEEVE. PRESSURE TEST DOUBLE GATE, UNABLE TO MAINTAIN 600 psi WITHOUT PUMPING. NO LEAKAGE AT WELLHEAD. PRESSURE BLEEDING OFF THROUGH BOTTOM OF CASING INTO FORMATION.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
4.0"	N/A	N/A	N/A
12.25"	0 to 202	9-5/8" (0-202)	K-55/40#
	to		
	to		
	to		

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-1	Date	06-08-90
Period Start	0700 6-07-90	Spud Date	06-01-90
Period End	0700 6-08-90	Day #	8
Depth Start	202 ft.	Contractor/Rig	Tonto/U-5000
Depth End	202 ft.	Day Shift-	
Footage		Driller	LaOrange
Mud Wt	N/A	Helper	J.K.
Mud Vis	N/A	Helper	Hanson
Mud pH	N/A	Night Shift-	
Mud Temp(F):IN	N/A OUT N/A	Driller	Cunningham
LC. @		Helper	Riley
		Helper	
Bits:		Foreman	Gillespie
		Drilling Mgr	Deymonaz

Additional Information: REMOVE BOP EQUIPMENT, RUN DRILL RODS TO TD AND PUMP 29 SACKS OF NEAT CEMENT, WAIT ON CEMENT. REINSTALL BOP EQUIPMENT.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
4.0"	N/A	N/A	N/A
12-1/4"	0 to 202	9-5/8" (0-202)	K-55/40#
	to		
	to		
	to		

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
Period Start 0700 6-08-90
Period End 0700 6-09-90
Depth Start 202 ft.
Depth End 202 ft.
Footage
Mud Wt N/A
Mud Vis N/A
Mud pH N/A
Mud Temp(F):IN N/A OUT N/A
LC. @
Bits:

Date 06-09-90
Spud Date 06-01-90
Day # 9
Contractor/Rig Tonto/U-5000
Day Shift-
Driller LaOrange
Helper Rose
Helper Hanson
Night Shift-
Driller Cunningham
Helper Riley
Helper
Foreman Gillespie
Drilling Mgr Deymonaz

Additional Information: PRESSURE TEST BOP EQUIPMENT TO 600 psi, CLEAN OUT CEMENT TO BOTTOM OF CASING. 22 HOURS ON STANDBY, WAIT ON HAWAII COUNTY PLANNING COMMISSION FOR APPROVAL TO RESUME DRILLING.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
4.0"	N/A	N/A	N/A
12.25"	0 to 202	9-5/8" (0-202)	K-55/40#
	to		
	to		
	to		

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
Period Start 0700 6-09-90
Period End 0700 6-10-90
Depth Start 202 ft.
Depth End 202 ft.
Footage 0 ft.
Mud Wt N/A
Mud Vis N/A
Mud pH N/A
Mud Temp(F):IN N/A OUT N/A
LC. @
Bits:

Date 06-10-90
Spud Date 06-01-90
Day # 10
Contractor/Rig Tonto/U-5000
Day Shift-
Driller LaOrange
Helper Hanson
Helper J.K.
Night Shift-
Driller Cunningham
Helper Riley
Helper
Foreman Fierback
Drilling Mgr Deymonaz

Additional Information: RUN 5 INCH SLEEVE AND HANG FROM WELL-HEAD. 20 HOURS STANDBY, WAITING ON HAWAII COUNTY PLANNING COMMISSION FOR APPROVAL TO RESUME DRILLING. CREW PAINTING RIG AND CLEANING SITE.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
4.0"	N/A	N/A	N/A
12.25"	0 to 202	9-5/8" (0-202)	K-55/40#
	to		
	to		
	to		

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
Period Start 0700 6-10-90
Period End 0700 6-11-90
Depth Start 202 ft.
Depth End 202 ft.
Footage
Mud Wt N/A
Mud Vis N/A
Mud pH N/A
Mud Temp(F):IN N/A OUT N/A
LC. @
Bits:

Date 06-11-90
Spud Date 06-01-90
Day # 11
Contractor/Rig Tonto/U-5000
Day Shift-
Driller LaOrange
Helper Hanson
Helper J.K.
Night Shift-
Driller Cunningham
Helper Riley
Helper
Foreman Gillespie
Drilling Mgr Deymonaz

Additional Information: 24 HOURS ON STANDBY, WAITING ON HAWAII COUNTY PLANNING COMMISSION FOR APPROVAL TO RESUME DRILLING. CREW PAINTING RIG, FABRICATING ADDITIONAL SOUND ABSORPTION STRUCTURES, CLEANING UP SITE.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
4.0"	N/A	N/A	N/A
12.25"	0 to 202	9-5/8" (0-202)	K-55/40#
	to		
	to		
	to		

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
Period Start 0700 6-11-90
Period End 0700 6-12-90
Depth Start 202 ft.
Depth End 202 ft.
Footage
Mud Wt N/A
Mud Vis N/A
Mud pH N/A
Mud Temp(F):IN N/A OUT N/A
LC. @
Bits:

Date 06-12-90
Spud Date 06-01-90
Day # 12
Contractor/Rig Tonto/U-5000
Day Shift-
Driller LaOrange
Helper J.K.
Helper Hanson
Night Shift-
Driller Cunningham
Helper Riley
Helper
Foreman Gillespie
Drilling Mgr Deymonaz

Additional Information: 24 HOURS ON STANDBY, WAITING ON HAWAII COUNTY PLANNING COMMISSION FOR APPROVAL TO RESUME DRILLING. CREW PAINTING AND SERVICING EQUIPMENT.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
4.0"	N/A	N/A	N/A
12.25"	0 to 202	9-5/8" (0-202)	K-55/40#
	to		
	to		
	to		

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
Period Start 0700 6-12-90
Period End 0700 6-13-90
Depth Start 202 ft.
Depth End 202 ft.
Footage
Mud Wt N/A
Mud Vis N/A
Mud pH N/A
Mud Temp(F):IN N/A OUT N/A
LC. @
Bits:

Date 06-13-90
Spud Date 06-01-90
Day # 13
Contractor/Rig Tonto/U-5000
Day Shift-
Driller LaOrange
Helper Rose
Helper Hanson
Night Shift-
Driller Cunningham
Helper Riley
Helper
Foreman Gillespie
Drilling Mgr Deymonaz

Additional Information: 24 HOURS ON STANDBY, WAITING ON HAWAII COUNTY PLANNING COMMISSION FOR APPROVAL TO RESUME DRILLING. CREW PAINTING AND SERVICING EQUIPMENT.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
4.0"	N/A	N/A	N/A
12.25"	0 to 202	9-5/8" (0-202)	K-55/40#
	to		
	to		
	to		

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-1	Date	06-14-90
Period Start	0700 6-13-90	Spud Date	06-01-90
Period End	0700 6-14-90	Day #	14
Depth Start	202 ft.	Contractor/Rig	Tonto/U-5000
Depth End	202 ft.	Day Shift-	
Footage	0 ft.	Driller	LaOrange
Mud Wt	N/A	Helper	Hanson
Mud Vis	N/A	Helper	J.K.
Mud pH	N/A	Night Shift-	
Mud Temp(F): IN	N/A OUT N/A	Driller	Cunningham
LC. @		Helper	Riley
		Helper	
Bits:		Foreman	Gillespie
		Drilling Mgr	Deymonaz

Additional Information: 24 HOURS ON STANDBY, WAITING ON HAWAII COUNTY PLANNING COMMISSION FOR APPROVAL TO RESUME DRILLING. CREW REPAINTING NEWLY PAINTED RIG AND SERVICING EQUIPMENT.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
4.0"	N/A	N/A	N/A
12.25"	0 to 202	9-5/8" (0-202)	K-55/40#
	to		
	to		
	to		

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-1	Date	06-15-90
Period Start	0700 6-14-90	Spud Date	06-01-90
Period End	0700 6-15-90	Day #	15
Depth Start	202 ft.	Contractor/Rig	Tonto/U-5000
Depth End	202 ft.	Day Shift-	
Footage	88 ft.	Driller	LaOrange
Mud Wt	N/R	Helper	Hanson
Mud Vis	N/R	Helper	J.K.
Mud pH	N/R	Night Shift-	
Mud Temp(F):IN	72 OUT N/A	Driller	Cunningham
LC. @		Helper	Riley
		Helper	
Bits:		Foreman	Gillespie
		Drilling Mgr	Deymonaz

Additional Information: 9 HOURS ON STANDBY, WAITING ON HAWAII COUNTY PLANNING COMMISSION FOR APPROVAL TO RESUME DRILLING. RECEIVED PERMISSION TO RESUME DRILLING AT 4 PM. CORE 101mm FROM 202-290 FT. WITHOUT RETURNS.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
12.25"	0 to 202	9-5/8" (0-202)	N/A
4.0"	202 to 290	N/A	K-55/40#
	to		
	to		
	to		

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-1	Date	06-16-90
Period Start	0700 6-15-90	Spud Date	06-01-90
Period End	0700 6-16-90	Day #	16
Depth Start	290 ft.	Contractor/Rig	Tonto/U-5000
Depth End	433 ft.	Day Shift-	
Footage	143 ft.	Driller	LaOrange
Mud Wt	8.4 #/gal	Helper	Rose
Mud Vis	40 sec.	Helper	Hanson
Mud pH	9.0	Night Shift-	
Mud Temp(F):IN	78 OUT N/A	Driller	Cunningham
LC. @		Helper	Riley
		Helper	J.K.
Bits:	101mm #17700-1	Foreman	Gillespie
	at 381 ft.	Drilling Mgr	Deymonaz

Additional Information: CORE WITH 101mm FROM 290-433 FT WITHOUT RETURNS, HOLE DRY TO BOTTOM.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
12.25"	0 to 202	9-5/8" (0-202)	K-55/40#
4.0"	202 to 433	N/A	N/A
	to		
	to		
	to		

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-1	Date	06-17-90
Period Start	0700 6-16-90	Spud Date	06-01-90
Period End	0700 6-17-90	Day #	17
Depth Start	433 ft.	Contractor/Rig	Tonto/U-5000
Depth End	566 ft.	Day Shift-	
Footage	133 ft.	Driller	LaOrange
Mud Wt	8.4 #/gal	Helper	Hanson
Mud Vis	41 sec.	Helper	Rose
Mud pH	9.0	Night Shift-	
Mud Temp(F):IN	78 OUT N/A	Driller	Cunningham
LC. @		Helper	Riley
		Helper	J.K.
Bits:		Foreman	Gillespie
		Drilling Mgr	Deymonaz

Additional Information: CORE WITH 101mm FROM 433-566 FT WITHOUT RETURNS, HOLE DRY TO BOTTOM.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
12.25"	0 to 202	9-5/8" (0-202)	K-55/40#
4.0"	202 to 566	N/A	N/A
	to		
	to		
	to		

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-1	Date	06-18-90
Period Start	0700 6-17-90	Spud Date	06-01-90
Period End	0700 6-18-90	Day #	18
Depth Start	566 ft.	Contractor/Rig	Tonto/U-5000
Depth End	669 ft.	Day Shift-	
Footage	103 ft.	Driller	LaOrange
Mud Wt	8.4 #/gal	Helper	Hanson
Mud Vis	41 sec.	Helper	Rose
Mud pH	9.0	Night Shift-	
Mud Temp(F): IN	79 OUT N/A	Driller	Cunningham
LC. @		Helper	Riley
		Helper	K.K.
Bits:	101mm bit #17700-5	Foreman	Gillespie
	@ 622 ft.	Drilling Mgr	Deymonaz

Additional Information: CORE WITH 101mm FROM 566-669 FT WITHOUT RETURNS. SOME FLUID IN HOLE. RUN BOTTOM HOLE TEMPERATURE SURVEY WITH SPAFFORD PROBE IN DRY HOLE, 10 MINUTES AFTER PUMPS CUT OFF: 79 (F) @ 587 FEET, SAME AS MUD-IN TEMPERATURE. BAIL HOLE FROM 4:00 TO 8:33 AM USING 2" x 30' BAILER INSIDE DRILL RODS SUSPENDED 1 FT. OFF BOTTOM. SAMPLES COLLECTED AFTER 2 HOURS, 3 HOURS AND 4.5 HOURS pH: 7.0. FLUID LEVEL STANDING AT BETWEEN 615-620 FT. ERIC TANAKA, DEPT. OF LAND & NATURAL RESOURCES REPRESENTATIVE ON SITE TO OBSERVE ENTIRE BAILING AND SAMPLE COLLECTION PROCEDURE.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
12.25"	0 to 202	9-5/8" (0-202)	K-55/40#
4.0"	202 to 566	N/A	N/A
	to		
	to		
	to		

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
Period Start 0700 6-18-90
Period End 0700 6-19-90
Depth Start 669 ft.
Depth End 755 ft.
Footage 86 ft.
Mud Wt 8.4 #/gal
Mud Vis 40 sec.
Mud pH 8.5
Mud Temp(F): IN 79 OUT N/A
LC. @
Bits: 101mm bit #17700-6 @ 730 ft.

Date 06-19-90
Spud Date 06-01-90
Day # 19
Contractor/Rig Tonto/U-5000
Day Shift-
Driller Gillespie
Helper Rose
Helper J.K.
Night Shift-
Driller Cunningham
Helper Riley
Helper K.K.
Foreman Fierback
Drilling Mgr Deymonaz

Additional Information: CORE WITH 101mm FROM 669-755 FT WITHOUT RETURNS, FLUID LEVEL IN HOLE AS MEASURED WHILE RETRIEVING CORE BARREL AT 620 FEET.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
12.25"	0 to 202	9-5/8" (0-202)	K-55/40#
4.0"	202 to 755	N/A	N/A
	to		
	to		
	to		

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-1	Date	06-20-90
Period Start	0700 6-19-90	Spud Date	06-01-90
Period End	0700 6-20-90	Day #	20
Depth Start	755 ft.	Contractor/Rig	Tonto/U-5000
Depth End	874 ft.	Day Shift-	
Footage	193 ft.	Driller	Gillespie
Mud Wt	8.4 #/gal	Helper	Rose
Mud Vis	41 sec.	Helper	J.K.
Mud pH	8.0	Night Shift-	
Mud Temp(F): IN	79 OUT N/A	Driller	Cunningham
LC. @		Helper	Riley
		Helper	K.K.
Bits:		Foreman	Fierback
		Drilling Mgr	Deymonaz

Additional Information: CORE WITH 101mm FROM 755-874 FT WITHOUT RETURNS, FLUID LEVEL IN HOLE AS MEASURED WHILE RETRIEVING CORE BARREL AT 620 FEET. BOTTOM HOLE TEMPERATURE MEASURED WHILE RETRIEVING CORE BARREL LESS THAN THE 100 (F) DEGREE MINIMUM READING ON THE MRT'S AT 813 FT. AND 866 FT.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
12.25"	0 to 202	9-5/8" (0-202)	K-55/40#
4.0"	202 to 874	N/A	N/A
	to		
	to		
	to		

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-1	Date	06-21-90
Period Start	0700 6-20-90	Spud Date	06-01-90
Period End	0700 6-21-90	Day #	21
Depth Start	874 ft.	Contractor/Rig	Tonto/U-5000
Depth End	984 ft.	Day Shift-	
Footage	110 ft.	Driller	Gillespie
Mud Wt	8.4 #/gal	Helper	Rose
Mud Vis	40 sec.	Helper	J.K.
Mud pH	8.5	Night Shift-	
Mud Temp(F): IN	79 OUT N/A	Driller	Cunningham
LC. @		Helper	Riley
		Helper	K.K.
Bits:		Foreman	Fierback
		Drilling Mgr	Deymonaz

Additional Information: CORE WITH 101mm FROM 874-894 FT WITHOUT RETURNS, FLUID LEVEL IN HOLE REMAINING AT 620 FT WHILE RETRIEVING CORE BARREL. BOTTOM HOLE TEMPERATURES WHILE RETRIEVING CORE BARREL LESS THAN THE 100 (F) DEGREE MINIMUM READING ON THE MRT'S AT 889 FT. AND 956 FT.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
12.25"	0 to 202	9-5/8" (0-202)	K-55/40#
4.0"	202 to 984	N/A	N/A
	to		
	to		
	to		

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
Period Start 0700 6-21-90
Period End 0700 6-22-90
Depth Start 984 ft.
Depth End 1040 ft.
Footage 56 ft.
Mud Wt 8.4 #/gal
Mud Vis 41 sec.
Mud pH 9.0
Mud Temp(F):IN 79 OUT N/A
LC. @

Bits: 101mm #19925-6 at 1,010 ft.
101mm #L-68514 at 1,034 ft.

Date 06-22-90
Spud Date 06-01-90
Day # 22
Contractor/Rig Tonto/U-5000
Day Shift-
Driller Gillespie
Helper Rose
Helper J.K.
Night Shift-
Driller Cunningham
Helper Riley
Helper K.K.
Foreman Fierback
Drilling Mgr Deymonaz

Additional Information: CORE WITH 101mm FROM 984-1,040 FT WITHOUT RETURNS, FLUID LEVEL IN HOLE AS MEASURED WHILE RETRIEVING CORE BARREL AT 620 FT. TRIP RODS FOR BIT CHANGE AT 1,020 FT. AND RUN DEVIATION SURVEY.

Deviation Survey

Run	Depth	Bearing	Degrees	Run	Depth	Bearing	Degrees
#1	213	N-05-E	1.00	#5	646	S-24-W	0.50
#2	292	S-26-W	1.00	#6	765	S-56-W	0.25
#3	410	S-65-W	0.50	#7	884	------	0.00
#4	528	S-82-W	0.25	#8	1,002	S-23-E	0.75

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
12.25"	0 to 202	9-5/8" (0-202)	K-55/40#
4.0"	202 to 1040	N/A	N/A
	to		
	to		
	to		

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-1	Date	06-23-90
Period Start	0700 6-22-90	Spud Date	06-01-90
Period End	0700 6-23-90	Day #	23
Depth Start	1040 ft.	Contractor/Rig	Tonto/U-5000
Depth End	1142 ft.	Day Shift-	
Footage	102 ft.	Driller	Gillespie
Mud Wt	8.4 #/gal	Helper	Rose
Mud Vis	40 sec.	Helper	J.K
Mud pH	8.5	Night Shift-	
Mud Temp(F):IN	79 OUT N/A	Driller	Cunningham
LC. @		Helper	Riley
		Helper	K.K.
Bits:	101mm bit #17700-2	Foreman	Fierback
		Drilling Mgr	Deymonaz

Additional Information: CORE WITH 101mm FROM 1,040-1,142 FEET WITHOUT RETURNS, FLUID LEVEL IN HOLE AS MEASURED WHILE RETRIEVING CORE BARREL AT 620 FT. BOTTOM HOLE TEMPERATURE MEASURED WHILE RETRIEVING CORE BARREL LESS THAT THE 100 (F) DEGREE MINIMUM READING ON THE MRT'S AT 1,065 AND 1,115 FEET.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
12.25"	0 to 202	9-5/8" (0-202)	K-55/40#
4.0"	202 to 1142	N/A	N/A
	to		
	to		
	to		

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-1	Date	06-24-90
Period Start	0700 6-23-90	Spud Date	06-01-90
Period End	0700 6-24-90	Day #	24
Depth Start	1142 ft.	Contractor/Rig	Tonto/U-5000
Depth End	1245 ft.	Day Shift-	
Footage	103 ft.	Driller	Gillespie
Mud Wt	8.4 #/gal	Helper	Rose
Mud Vis	41 sec.	Helper	J.K.
Mud pH	8.5	Night Shift-	
Mud Temp(F): IN	79 OUT N/A	Driller	Cunningham
LC. @		Helper	Riley
		Helper	K.K.
Bits:		Foreman	Fierback
		Drilling Mgr	Deymonaz

Additional Information: CORE WITH 101mm FROM 1,142-1,245 FEET WITHOUT RETURNS. FLUID LEVEL IN HOLE REMAINING AT 620 FT WHILE RETRIEVING CORE BARREL. BOTTOM HOLE TEMPERATURES WHILE RETRIEVING CORE BARREL LESS THAT THE 100 (F) DEGREE MINIMUM READING ON THE MRT'S AT 1,163 AND 1,220 FEET.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
12.25"	0 to 202	9-5/8" (0-202)	K-55/40#
4.0"	202 to 1245	N/A	N/A
	to		
	to		
	to		

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole # SOH-1
Period Start 0700 6-24-90
Period End 0700 6-25-90
Depth Start 1245 ft.
Depth End 1334 ft.
Footage 89 ft.
Mud Wt 8.4 #/gal
Mud Vis 42 sec.
Mud pH 8.0
Mud Temp(F):IN 78 OUT N/A
LC. @

Bits: 101mm #19999-3
on at 1,278 ft.

Date 06-25-90
Spud Date 06-01-90
Day # 25
Contractor/Rig Tonto/U-5000
Day Shift-
Driller Gillespie
Helper Rose
Helper J.K.
Night Shift-
Driller Cunningham
Helper Riley
Helper K.K.
Foreman Fierback
Drilling Mgr Deymonaz

Additional Information: CORE WITH 101mm FROM 1,245-1,334 FEET WITHOUT RETURNS. FLUID LEVEL MEASURED WHILE RETRIEVING CORE BARREL REMAINING AT 620 FT. BIT CHANGE AT 1,278 FT. BOTTOM HOLE TEMPERATURE MEASURED AT 1,268 AND 1,317 FT (READINGS LESS THAN THE 100 (F) DEGREE MINIMUM READING ON THE MRT'S).

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
12.25"	0 to 202	9-5/8" (0-202)	K-55/40#
4.0"	202 to 1334	N/A	N/A
	to		
	to		
	to		

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-1	Date	06-26-90
Period Start	0700 6-25-90	Spud Date	06-01-90
Period End	0700 6-26-90	Day #	26
Depth Start	1334 ft.	Contractor/Rig	Tonto/U-5000
Depth End	1418 ft.	Day Shift-	
Footage	84 ft.	Driller	Gillespie
Mud Wt	8.4 #/gal	Helper	Rose
Mud Vis	40 sec.	Helper	J.K.
Mud pH	8.5	Night Shift-	
Mud Temp(F):IN	77 OUT N/A	Driller	Cunningham
LC. @		Helper	Riley
		Helper	K.K.
Bits:		Foreman	Fierback
		Drilling Mgr	Deymonaz

Additional Information: CORE WITH 101mm FROM 1,334-1,418 FEET WITHOUT RETURNS, FLUID LEVEL IN HOLE AS MEASURED WHILE RETRIEVING CORE BARREL AT 620 FT. BOTTOM HOLE TEMPERATURE MEASURED WHILE RETRIEVING CORE BARREL LESS THAN THE 100 (F) DEGREE MINIMUM READING ON THE MRT'S AT 1,348 AND 1,398 FEET.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
12.25"	0 to 202	9-5/8" (0-202)	K-55/40#
4.0"	202 to 1418	N/A	N/A
	to		
	to		
	to		

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-1	Date	06-27-90
Period Start	0700 6-26-90	Spud Date	06-01-90
Period End	0700 6-27-90	Day #	27
Depth Start	1418 ft.	Contractor/Rig	Tonto/U-5000
Depth End	1508 ft.	Day Shift-	
Footage	90 ft.	Driller	Gillespie
Mud Wt	8.4 #/gal	Helper	Rose
Mud Vis	40 sec.	Helper	J.K.
Mud pH	9.0	Night Shift-	
Mud Temp(F):IN	78 OUT N/A	Driller	Cunningham
LC. @		Helper	Riley
		Helper	K.K.
Bits:	101mm #1999-5	Foreman	Fierback
	on at 1,459 ft.	Drilling Mgr	Deymonaz

Additional Information: CORE WITH 101mm FROM 1,418-1,508 FEET WITHOUT RETURNS, FLUID LEVEL IN HOLE AS MEASURED WHILE RETRIEVING CORE BARREL AT 620 FT. TRIP RODS FOR BIT CHANGE AT 1,459 FEET. BOTTOM HOLE TEMPERATURE MEASURED WHILE RETRIEVING CORE BARREL LESS THAN THE 100(F) DEGREE MINIMUM READING ON THE MRT'S @ 1,465 FEET.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
12.25"	0 to 202	9-5/8" (0-202)	K-55/40#
4.0"	202 to 1508	N/A	N/A
	to		
	to		
	to		

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-1	Date	06-28-90
Period Start	0700 6-27-90	Spud Date	06-01-90
Period End	0700 6-28-90	Day #	28
Depth Start	1508 ft.	Contractor/Rig	Tonto/U-5000
Depth End	1615 ft.	Day Shift-	
Footage	107 ft.	Driller	Gillespie
Mud Wt	8.4 #/gal	Helper	Rose
Mud Vis	41 sec.	Helper	J.K.
Mud pH	8.5	Night Shift-	
Mud Temp(F):IN	77 OUT N/A	Driller	Cunningham
LC. @		Helper	Riley
		Helper	K.K.
Bits:		Foreman	Fierback
		Drilling Mgr	Deymonaz

Additional Information: CORE WITH 101mm FROM 1,508-1,615 FEET WITHOUT RETURNS. FLUID LEVEL IN HOLE REMAINING AT 620 FT. WHILE RETRIEVING CORE BARREL. BOTTOM HOLE TEMPERATURE WHILE RETRIEVING CORE BARREL LESS THAN THE 100(F) DEGREE MINIMUM READING ON THE MRT'S @ 1,508 FT., 1,564 FT., AND 1,604 FT.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
12.25"	0 to 202	9-5/8" (0-202)	K-55/40#
4.0"	202 to 1615	N/A	N/A
	to		
	to		
	to		

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-1	Date	06-29-90
Period Start	0700 6-28-90	Spud Date	06-01-90
Period End	0700 6-29-90	Day #	29
Depth Start	1615 ft.	Contractor/Rig	Tonto/U-5000
Depth End	1709 ft.	Day Shift-	
Footage	94 ft.	Driller	Gillespie
Mud Wt	8.4 #/gal	Helper	Rose
Mud Vis	45 sec.	Helper	J.K.
Mud pH	9.0	Night Shift-	
Mud Temp(F):IN	76 OUT N/A	Driller	Cunningham
LC. @		Helper	Riley
		Helper	K.K.
Bits:	#19999-4	Foreman	Fierback
		Drilling Mgr	Deymonaz

Additional Information: TRIP RODS FOR BIT CHANGE. DRILL AHEAD TO 1,709 FEET WITHOUT RETURNS. FLUID LEVEL IN HOLE REMAINING AT 620 FT. WHILE RETRIEVING CORE BARREL. BOTTOM HOLE TEMPERATURE WHILE RETRIEVING CORE BARREL LESS THAN 100(F) DEGREE MINIMUM READING ON THE MRT'S @ 1,660 AND 1,709 FT.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
12.25"	0 to 202	9-5/8" (0-202)	K-55/40#
4.0"	202 to 1709	N/A	N/A
	to		
	to		
	to		

HAWAII NATURAL ENERGY INSTITUTE
DAILY DRILLING REPORT

Hole #	SOH-1	Date	06-30-90
Period Start	0700 6-29-90	Spud Date	06-01-90
Period End	0700 6-30-90	Day #	30
Depth Start	1709 ft.	Contractor/Rig	Tonto/U-5000
Depth End	1802 ft.	Day Shift-	
Footage	93 ft.	Driller	Gillespie
Mud Wt	8.9 #/gal	Helper	Rose
Mud Vis	45 sec.	Helper	J.K.
Mud pH	9.0	Night Shift-	
Mud Temp(F):IN	77 OUT N/A	Driller	Cunningham
LC. @		Helper	Riley
		Helper	K.K.
Bits:		Foreman	Fierback
		Drilling Mgr	Deymonaz

Additional Information: CORE WITH 101mm FROM 1709-1802 FT. WITHOUT RETURNS. FLUID LEVEL IN HOLE REMAINING AT 620 FEET WHILE RETRIEVING CORE BARREL. BOTTOM HOLE TEMPERATURES WHILE RETRIEVING CORE BARREL LESS THAN THE 100 (F) DEGREE MINIMUM READING ON THE MRT'S AT 1752 AND 1802 FEET.

History

Hole Size	Interval (ft)	Casing Size (interval)	Grade/Weight
12.25"	0 to 202	9-5/8" (0-202)	K-55/40#
4.0"	202 to 1802	N/A	N/A
	to		
	to		
	to		

APPENDIX E

ENVIRONMENTAL/NOISE MONITORING ACTIVITIES -- SOH 1

DARBY ACOUSTICAL CONSULTANTS, LTD.
dba
DARBY
& ASSOCIATES
ACOUSTICAL CONSULTANTS

#89-10
April 19, 1990

University of Hawaii
Hawaii Natural Energy Institute
2540 Dole St., Holmes Hall #206
Honolulu, Hawaii 96822

Attention: Mr. Art Seki

RE: DRILLING RIG NOISE CONTROL

Dear Art:

This is to confirm my observations and verbal recommendations made during our visit to the Big Island on April 16, 1990:

(1) At SOH #4, noise levels at the noise monitoring station, about 80 ft from the rig, were in the range of approximately 65 to 67 dBA during our visit. When we arrived, one of the acoustical panels beneath the engine was partly open, and later in the day two of the engine enclosure's side panels were removed to prevent engine overheating. We understand that, with the warmer conditions presently being experienced, it is not possible to run the engine fully enclosed.

(2) The dominant noise source during our visit was the engine itself. Noise is being transmitted mainly through the enclosure openings and from the radiator discharge. The existing exhaust silencers appear to be working effectively. (See Figure 1.)

(3) Previous data obtained at the noise monitoring station show significant periods of time when levels between 70 to 75 dBA were recorded.

(4) Because of the proximity of SOH #1 to the Jones and Loughlin residences, some additional noise control measures are essential to reduce the noise impact at these locations. The three-sided enclosure indicated in Figure 2, together with an acoustically lined air inlet plenum below the engine (Figure 3), should reduce engine noise transmitted in the direction away from the rig by an estimated 8 to 10 dBA. (If a further noise reduction is found necessary after the rig commences operations at SOH #1, the effectiveness of the enclosure could probably be improved by adding a roof.)

(5) It was agreed that permission would be sought from Mr. Loughlin to move the noise monitoring station from its present location behind his buildings to a new position by the driveway, adjacent to the property line between his residence and the Jones residence. Also, the microphone height will be increased to about 12 ft above ground level.

* * *

Please call if you have any questions on the above.

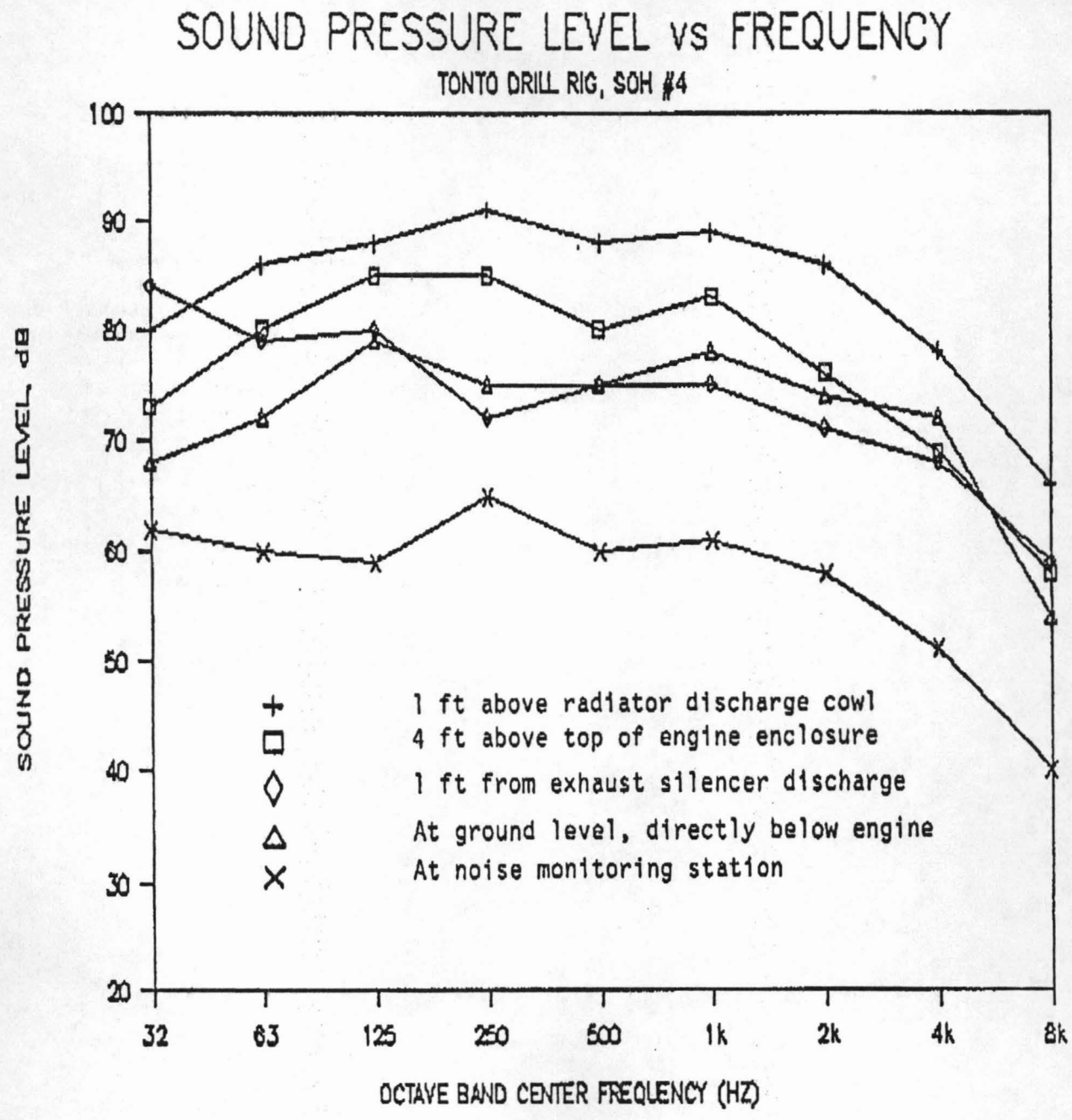
Sincerely,

John Shearer

John C. Shearer

JCS/ld

Enclosures



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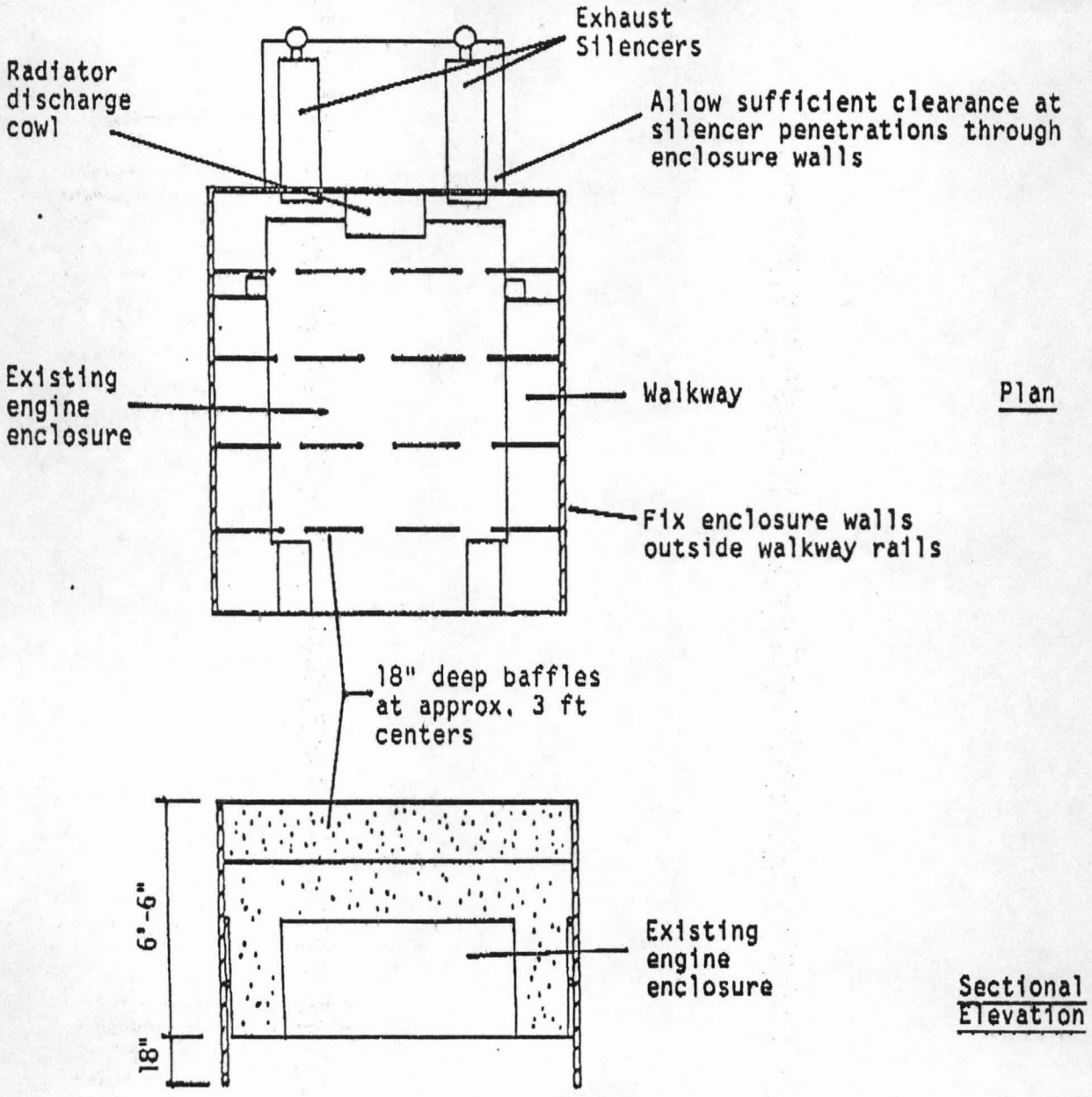
ACOUSTICAL CONSULTANTS

Figure 1 Noise Levels Recorded at Various Locations on and near Drilling Rig on 4/16/90



Notes: 1) Enclosure wall to comprise plywood barrier (at least 1/2" thick) with interior lining of 2" thick duct liner retained by expanded metal or perforated metal.

2) Acoustic baffles to be of similar construction to enclosure wall, but with solid barrier material faced both sides with 2" duct liner.

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ACOUSTICAL CONSULTANTS

Figure 2 Proposed Three-Sided Enclosure Around Diesel Engine (Schematic Only/N.T.S.)

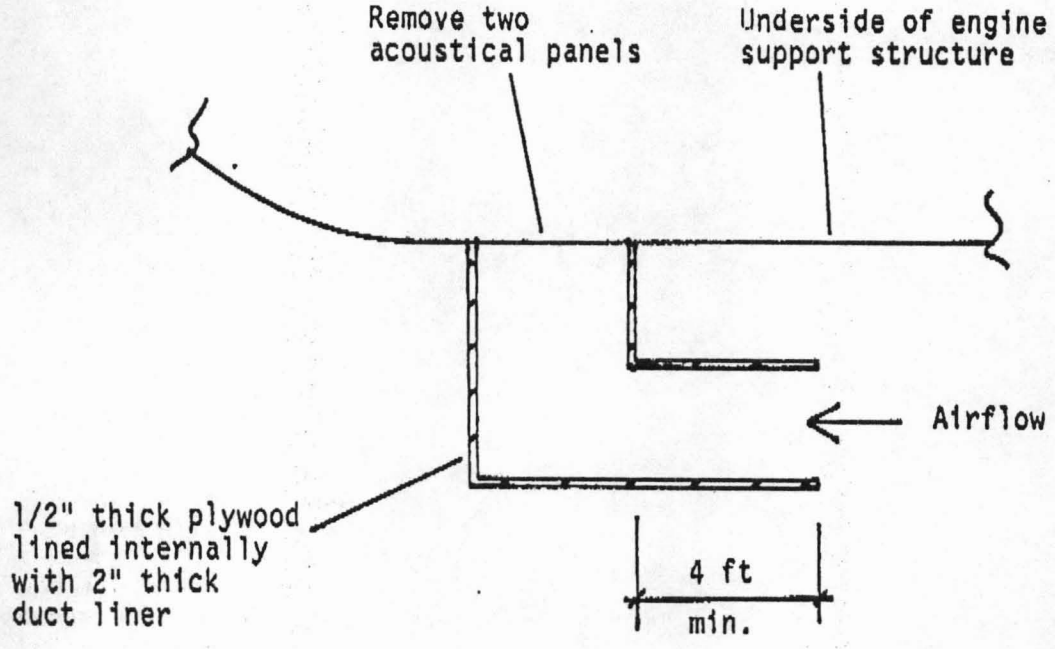

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Figure 3 Proposed Acoustically Lined Engine Air Intake Plenum

as required at the floor level (and located on the interior side only) in order to create convection air flow within the enclosure. Or provide a fan to create air movement.

(c.) Seal up the engine and machinery compartment including: repairing the faulty door so it closes tightly without noise leaks; closing the present openings where hoses and/or pipes penetrate the compartment; and closing any other openings which may become more obvious noise leaks after the above ducts and generator extensions are implemented. For smaller openings, the use of heavy, flexible, non-porous material, e.g., fabric/neoprene belting, cemented

DARBY ACOUSTICAL CONSULTANTS, LTD.
dba
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#89-10
June 8, 1990

Mr. Art Seki
University of Hawaii
Hawaii Natural Energy Institute
2540 Dole St., Holmes Hall #206
Honolulu, Hawaii 96822

SUBJECT: MODIFIED DRILLING RIG NOISE CONTROL MEASURES - SOH #1

Dear Art:

Following are recommendations regarding further quieting the drilling rig now located at SOH #1 and having had mechanical modifications since our report on the same subject dated April 19, 1990. Additional noise level measurements were made and I had discussions with you; John Deymonaz; and Mike, the drilling supervisor, with respect to further noise reduction measures.

It is understood that the following measures will be taken:

total enclosure surface area are acceptable.

(b.) Experiment using 1" rope or neoprene strips to eliminate direct contact between pipes when stacked in the racks.

(c.) Consider building a large plywood noise barrier wall on top of the container located under the front-end (engine-end) of the rig. Please contact us if this is to be pursued and we will help in establishing dimensions and shape for effective further noise control.

(d.) If required, consider increasing the height of the wooden ducts as well as adding another thickness of duct liner (to a total of 4" thick) in order to more efficiently absorb low frequencies.

The duct liner should be attached using the adhesive provided by Acoustical Material Services (AMS). Enclosure 1 provides product cut and application recommendations for the duct liner. Enclosure 2 lists various attachment systems that you may want to use in conjunction with the adhesive and the chicken wire facing. It was also discussed that the thin plastic sheeting recommended earlier should not be used in this case because it is too fragile, and openings in the sheeting may allow longer periods of moisture containment.

Sincerely,

Ronald A. Darby, P.E.

RAD/ld

Enclosures

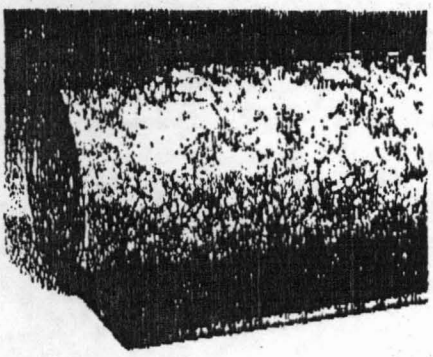
SUBMITTAL SHEET

OWENS-CORNING FIBERGLAS

ENCLOSURE 1
(1 of 2)

Owens-Corning Aeroflex® Duct Liner

TYPE	THICKNESS	
☐ 150	☐ ½"	☐ 1½"
☐ 200	☐ 1"	☐ 2"
☐ 300		



Uses

Owens-Corning Fiberglas Aeroflex® duct liner is designed for use as an acoustical insulation to absorb air conditioning and heating equipment and blower noise in sheet metal ducts and plenums operating at velocities up to 6000 fpm and temperatures to 250F. It also acts as a thermal insulation, and may eliminate the necessity of insulating ducts externally to conserve heat or prevent condensation. The product is applied to the interior of the ductwork or plenum.

Description

Owens-Corning Fiberglas Aeroflex duct liner is a bonded mat of glass fiber coated with a black-pigmented fire-resistant coating on the airstream side. This coating tightly bonds the surface fibers to resist damage during installation and in service, and provides a uniquely tough airstream surface. Aeroflex duct liner is available in three types, and in thicknesses of ½", 1", 1½", and 2" It complies with the requirements of NFPA 90A.

Physical Properties	Test Method	Specification
Surface burning characteristics* (UL listed)	UL 723*	Flame spread 25* Smoke developed 50
Thermal conductivity (k) @ 75F mean temperature, Btu•in/h•ft²•deg F	ASTM C 518	Type "k" 150 0.28 200 0.26 300 0.24
Corrosiveness	ASTM C 665	Will not cause corrosion greater than that caused by sterile cotton on aluminum, steel or galvanized steel.
Fungi resistance	ASTM C 665	Will not support or promote mold or fungus growth.

(1) Owens-Corning Fiberglas or other test method available on request.

*The surface burning characteristics of this product have been determined in accordance with UL 723. This standard should be used to measure and describe the properties of materials, products or assemblies in response to heat and flame under controlled laboratory conditions and should not be used to describe or appraise the fire hazard or fire risk of materials, products or assemblies under actual fire conditions. However, results of this test may be used as elements of a fire risk assessment which takes into account all of the factors which are pertinent to an assessment of the fire hazard of a particular end use. Values are reported to the nearest five (5) rating.

Specification compliance

Owens-Corning Fiberglas Aeroflex duct liner insulation complies with the property requirements of ASTM specification C1071 which replaces HH-I-545B.

Product marking

Insulation thickness, name of manufacturer and type appear continuously printed on the airstream surface of Owens-Corning duct liner for easy identification. This assures that the installed product can be inspected for specification compliance after installation.

Availability

Aeroflex duct liner is available in the following combinations of thickness and density:

Product	½"	1"	1½"	2"
Type 150		●	●	●
Type 200	●	●	●	●
Type 300	●	●	•	•

*Available in 10-foot lengths only.

Roll Widths

Popular widths are available as standard Owens-Corning products. Other widths can be made-to-order.

A5

ENCLOSURE 1
(2 of 2)

Acoustical performance

Several techniques for evaluating duct liner acoustical performance are in common use. However, some of the specification values in existence were derived utilizing now obsolete test methods.

ASTM C 1071 is considered to be the current industry standard. Owens-Corning's Aeroflex duct liner meets or exceeds the sound absorption coefficients from this standard as listed at right.

Sound absorption coefficients

Specification	Sound absorption coefficients at Octave Band Center Frequencies, Hz 125	250	500	1000	2000	4000	NRC	Test Method
ASTM C 1071, Type I (Blanket)								ASTM C 423 Type A mounting
0.5" thick	.02	.07	.18	.37	.52	.67	.30	
1.0" thick	.04	.19	.36	.66	.69	.72	.45	
1.5" thick	.08	.31	.58	.75	.82	.81	.60	
2.0" thick	.16	.42	.76	.85	.85	.83	.70	
ASTM C 1071, Type II (slab)								
1.0" thick	.02	.20	.52	.73	.82	.84	.55	
1.5" thick	.05	.40	.77	.88	.88	.86	.75	
2.0" thick	.12	.67	.99	.97	.91	.87	.90	

Application Recommendations

All portions of duct designated to receive duct liner shall be completely covered with Aeroflex duct liner. Transverse joints shall be neatly butted and there shall be no interruptions or gaps.

The black coated surface of the duct liner shall face the air stream.

Aeroflex duct liner shall be adhered to the sheet metal with 90% coverage of adhesive, and all exposed leading edges and all transverse joints coated with adhesive.

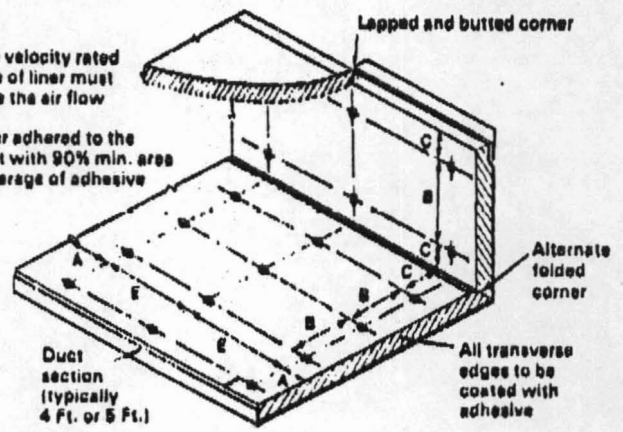
Aeroflex duct liner shall be additionally secured with mechanical fasteners which shall compress the duct liner sufficiently to hold it firmly in place.

Aeroflex duct liner shall be cut to assure overlapped and compressed longitudinal corner joints.

No. Pins	Liner Interior Width
0	8" dn
2	9"-16"
3	17"-28"
4	29"-40"
5	41"-52"
6	53"-64"
7	65"-76"
8	77"-88"
9	89"-100"

The velocity rated side of liner must face the air flow

Liner adhered to the duct with 90% min. area coverage of adhesive



When velocity exceeds 4000 FPM use metal nosing on every leading edge. Nosing may be formed on duct or by channel or zee attached by screws, rivets or welds.

Maximum spacing for fasteners. Actual intervals are approximate.

Velocity	Dimensions A	B	C	D
0-2500 FPM	3"	12"	4"	18"
2501-6000 FPM	3"	8"	4"	16"

DETAIL-A

OWENS-CORNING FIBERGLAS

OWENS-CORNING FIBERGLAS CORP.
Mechanical Insulation Products
Fiberglas Tower, Toledo, Ohio 43659

Pub. 1-MS-14720-A Litho in USA January 1988

OWENS/CORNING FIBERGLAS

Technical Bulletin

ENCLOSURE 2
(1 of 5)

Feb. 3, 1982

number 41-82-10

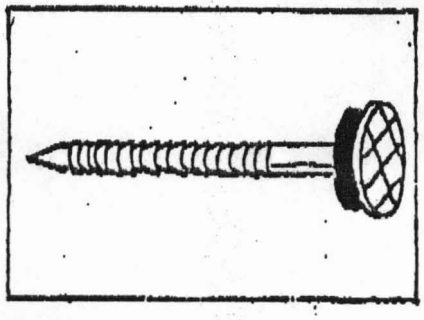
file Commercial Ceilings

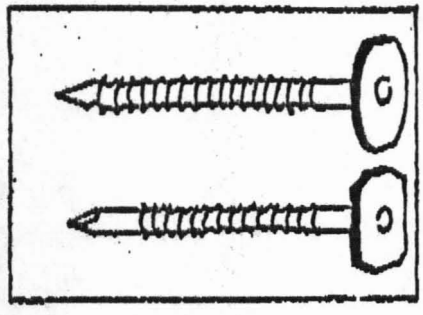
ATTACHMENT SYSTEMS

The material contained within this bulletin is intended to familiarize builders and contractors with the various attachment materials and tools used in construction. Many of these attachments may be adapted for use in the installation of insulation blankets and boards to wood, metal, masonry and other surface materials. This bulletin is primarily a reference for confronting unusual or difficult installation situations. For application information about a product, contact the manufacturers whose addresses are listed within each section.

NOTICE: Nothing herein shall be construed as a warranty expressed or implied, as to merchantibility or fitness of any product mentioned. Consult manufacturer's literature for information on warnings, uses and limitations. Owens-Corning cannot be responsible for the performance of products manufactured or marketed by others, nor does it endorse the use of any of these attachments for installing Owens-Corning Fiberglas products.

1. NAILS FOR WOOD & MASONRY - Available in various sizes; some with 1" diameter caps.





Denistion Company
3655 W. 127th St.
Chicago, IL 60658
(312) 388-3800

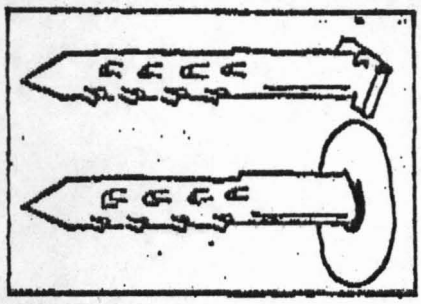
Independent Nail, Inc.
106 Hale Street
Bridgewater, MA 02324
(617) 697-6992

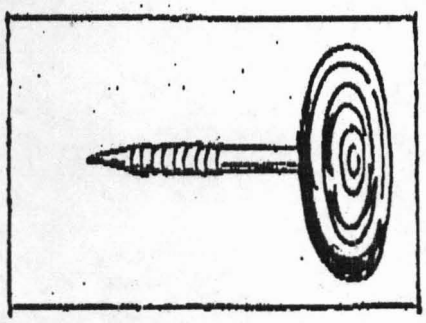
Maze Nails
Div. of W.H. Maze Co.
100 Church Street
Peru, IL 61354
(815) 223-8290

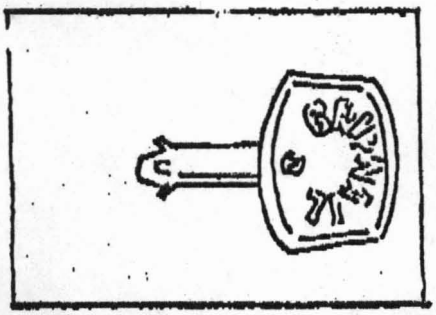
Simplex Nails, Inc.
Industrial Tract
P.O. Box 545
Americus, GA 31709
(912) 924-2767

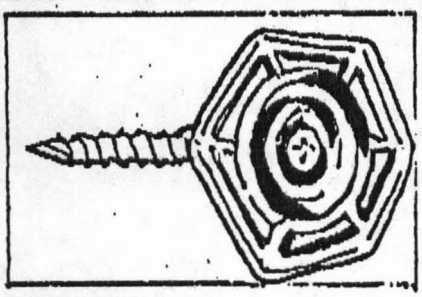
ENCLOSURE 2
(2 of 5)

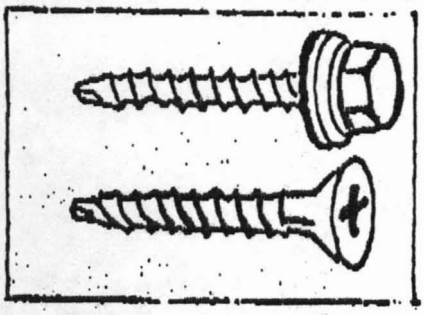
2. FASTENERS FOR METAL SURFACES











a. Insulation Clips with Large Heads.

B.F. Goodrich Construction Products
P.O. Box 39130
Solon, OH 44139
(216) 248-4391

b. Metal Nails

ES Products
30 Pleasant St.
New Rochelle, NY 10801
(914) 235-1700

Gripnail Corporation
East Providence, RI 02914

c. Metal Screws - Available in various lengths; some with metal plates.

Buildex
Div. of Illinois Tool Works, Inc.
2500 Brickvale Drive
Elk Grove Village, IL 60007
(312) 595-3500

Construction Fasteners, Inc.
P.O. Box 6326
Wyomissing, PA 19610
(215) 376-5751

Deniston Company
3655 W. 127th St.
Chicago, IL 60658
(312) 388-3800

Fabco Fastening Systems
Townsend Div. of Textron, Inc.
1952 Water St.
West Newton, PA 15089
(412) 872-6200

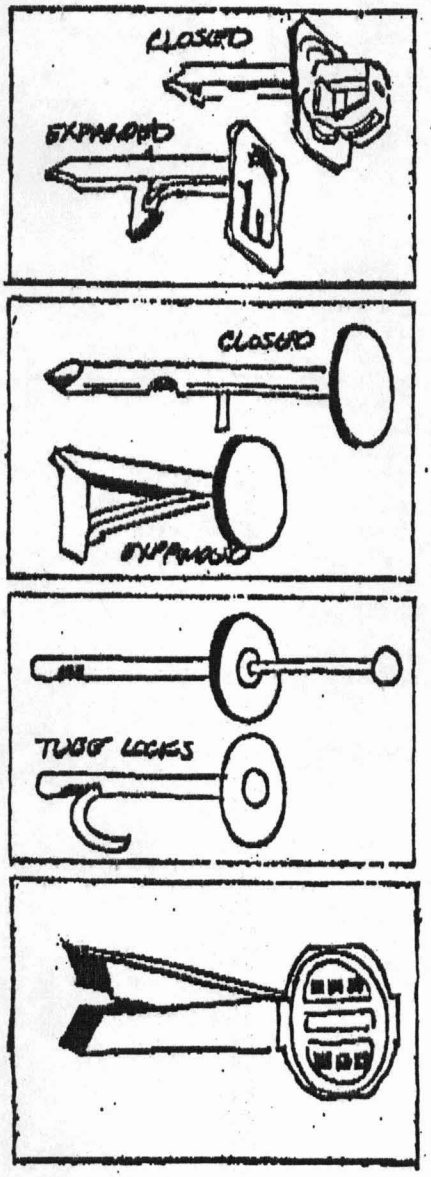
GAF Corporation
Building Materials Group
140 W. 51 St.
New York, NY 10020

ENCLOSURE 2
(3 of 5)

Grefco, Inc.
Building Products Division
2905 Butterfield Rd.
Oak Brook, IL 60521
(312) 654-4500

Parker-Kalon
Roberts Rd.
Campbellsville, KY 42718
(502) 456-3521

3. FASTENERS FOR LOW DENSITY SUBSTRATE



a. Capped ES Nail[R]

ES Products
30 Pleasant St.
New Rochelle, NY 10801
(914) 235-1700

b. Insulfelt Loc-Nail

E.G. Building Fasteners Corporation
663 Fifth Ave.
New York, NY 10022
(212) 685-6457

c. Simplex[R] Tube-Lok Nail

Simplex Nails, Inc.
Industrial Tract
P.O. Box 545
Americus, GA 31709
(912) 924-2767

d. Zonolite[R] Base Ply Fastener

W. R. Grace & Co.
Construction Products Div.
62 Whittemore Ave.
Cambridge, MA 02140

9. HANDHELD POWER FASTENING TOOLS

a. Pneumatic Staplers

Bostich Fastening Systems, A Textron Company, 3089 Shadycrest Dr., Cincinnati, OH 45239, (513) 825-7771

Duo-Fast Corporation, 3702 River Rd., Franklin Park, IL 60131

b. Powder-actuated systems

Bostich Fastening Systems, A Textron Company, 3089 Shadycrest Dr., Cincinnati, OH 45239, (513) 825-7771

Ladd Tool Company, Inc., Lincoln Industrial Park, P.O. Box 467 West Chester, PA 19380, (215) 436-4838

Ramset Fastening Systems, 275 Winchester Ave., New Haven, CT 06511

10. ADHESIVES

Duro-Dyne Corporation, Rte. 110, Farmingdale, NY 11735, (516) 249-9000

Goodloe, E. Moore, Inc., 2811 N. Vermillion St., Danville, IL 61832, (217) 446-7900

3M Company, Adhesives, Coatings and Sealers Divisions, 3M Center, St. Paul, MN 55101, (612) 733-1110

11. ATTACHMENTS FOR METAL BUILDINGS - Owens-Corning Supply units carry various attachment systems for metal building applications. Contact the Supply unit nearest you for more information on the systems they carry.

APPENDIX F

COMPLAINT LOGS AND RESPONSE -- SOH 1

Public Contact Sheet

First Contact: answering service 0 ✓
mobile phone 0
walk-in 0
other 0 Specify-

Date 6-1-90 Time 2:44 PM

Nature of contact: request for information 0
complaint call 0 ✓

Residents name: Debbie Pommerank
address : TMK: 3-1-4-017-004
phone number : 965-8049

Contacted by, R. Kochi Date 6-1 time _____

Remarks:

Resident says lights too brite, and sound of drill rig gives her a headache.

Action taken:

Spoke to J. Deymonaz at drill rig about changing direction of floodlight and possibly building plywood sound baffels for motors.

For:

SOH

initiated by R. Kochi
date 6-1-90

Public Contact Sheet

First Contact: answering service 0
mobile phone 0
walk-in 0
other 0 Specify- referred by P&V office to R.K.

Date 6-4-90 Time 0825

Nature of contact: request for information 0 ✓
complaint call 0 ✓

Residents name: Paul Majrska
address : Tmc: 3-1-4-01-45
phone number : 965-8710

Contacted by, R. Kachy Date 6-4 time _____

Remarks:

Called resident who wanted to know about night time noise. He said it was very still last night and machinery noise woke him up. Resident approx ½ mile N. of SOH-1 site.

Action taken:

Referred to J. Daymond after speaking to resident for follow up. Mr. Majrska. retired Airline pilot.

For: SOH

initiated by R. Kachy
date 6-4-90

Public Contact Sheet

First Contact: answering service 0 ✓ to office no.
mobile phone 0
walk-in 0
other 0 Specify-

Date 6-4-90 Time 1306

Nature of contact: request for information 0
complaint call 0 ✓

Residents name: Debbie Pommerenk
address : TMK: 3-1-4-17-004
phone number : 965 8049

Contacted by, R. Rocky Date 6-4-90 time 1315

Remarks:

Resident says drill rig really loud last night 3:30 Am 6:30 Am 6-3-90
worried about hearing being permanently damaged
claims the hum in her head from HGP-A just went away
one month ago.

Action taken:

Spoke to her on phone 5 min. about continuous noise level
measurements being taken in area around drill rig.
Notified J. Deymonaz about plywood barriers.

For: sort

initiated by R. Rocky
date 6-4-90

Public Contact Sheet

First Contact: answering service 0 ✓ to office.
mobile phone 0
walk-in 0
other 0 Specify-

Date 6-4-90 Time 1330

Nature of contact: request for information 0
complaint call 0 ✓

Residents name: Bob Petricci
address : Leilani est.
phone number : 965-9471

Contacted by, R. Kochy Date 6-4-90 time 1335

Remarks:

Resident says drill rig noisy last night, doesn't like it, and is keeping notes. Wanted to know about emissions or water out of well.

Action taken:

I told him SOH-1 ~~would~~ was not producing H_2S or water and purpose of hole was to obtain geologic cross section only.

For: SOH

initiated by R. Kochy

date 6-4-90

Public Contact Sheet

First Contact: answering service 0 — Not specified
mobile phone 0
walk-in 0
other 0 Specify-

Date 6-4-90 Time 1404

Nature of contact: request for information 0
complaint call 0

Residents name: Richard Jones
address : Tinx! 3-1-4-090-002
phone number : 965-9985

Contacted by, R. Koch Date 6-4 time _____

Remarks:

Resident wanted to know about SOH rig noise monitoring. says daytime O.K., after 9 PM noticeable. Resident very reasonable. Says noise woke him up last 2 nights.

Action taken:

I told him noise instrument was located in his neighbors yard and information would be available to him. Referred to J. Daymond for follow-up.

For: SOH.

initiated by R. Koch

date 6-4-90

Public Contact Sheet

First Contact: answering service ✓ to mobile phone.
mobile phone 0
walk-in 0
other 0 Specify-

Date 6-13-90 Time 0951

Nature of contact: request for information 0
complaint call ✓

Residents name: Bonnie Gold
address : Not given
phone number : No phone

Contacted by. No contact Date — time —

Remarks:

Resident (?) Complained of lights and noise all night, bulldozing all day, annoying to her family.

Action taken:

SOH rig Not drilling (motor running for lights) resume drilling 6-14-90 - 1600 hrs.
No bulldozing at SOH other than initial site prep.
Rig Check with J. Deymonaz 6-15-90 1600 about back up during my off island days 16th + 17th. Answering service to refer all calls to him.

For: SOH

initiated by R. Kocby
date 6-18-90

Public Contact Sheet

First Contact: answering service ✓ to mobile.
mobile phone 0
walk-in 0
other 0 Specify-

Date 6-28-90 Time 0715

Nature of contact: request for information 0
complaint call ✓

Residents name: Debbie Pommerenk
address :
phone number : 965-8049

Contacted by, R. Kochy Date 6-28 time 0800

Remarks:

Resident complained about night time noise 3 Am on — and claims to be locked out of access to her property, by newly installed gate.

Action taken:

Referred to J. Daymond about access, he claims to have already spoken to her about gate and road not being her legal access

For: SOH

initiated by R. Kochy
date 6-28-90

APPENDIX G

NOISE COMPLAINT ANALYSIS -- SOH 1

D.L. ADAMS ASSOCIATES, LTD.
dba
DARBY
& ASSOCIATES
ACOUSTICAL CONSULTANTS

#89-10
July 30, 1990

University of Hawaii
Hawaii Natural Energy Institute
Holmes Hall #206
2540 Dole Street
Honolulu, Hawaii 96822

Attention: Mr. Art Seki

Subject: Summary of Noise Monitoring Efforts from April 1, 1990 through June 30, 1990

Dear Mr. Seki:

Our report dated April 10, 1990 provided a summary of noise level data recorded from January 6, 1990 to March 30, 1990. Following is a summary of noise monitoring efforts performed from April 1, 1990 to June 30, 1990.

A. Overall Noise Monitoring - Table 1 is a summary of monitoring activities, indicating that environmental noise monitoring has been performed at a total of four locations for a total of about 91 days on-line over a three month period. There are two automated noise monitoring stations (described as "A" and "B") which are serviced by Alpha-Micro Systems of Hilo. Also, Robert Kochy has performed numerous manual noise level surveys in response to specific complaints during this time period.

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KAILUA, HAWAII 96734 • (808) 254-3318 • FAX (808) 254-5295

B. Evaluation of Specific Noise Complaints from SOH #4 Drilling Site on April 3, and 27, 1990 - Our report to you dated June 12, 1990 evaluated two noise complaints from Ms. Edla "Carrie" Chory concerning noise from SOH #4. The report is attached as Encl. 1.

C. General Comments on Noise from the Drilling Rig at SOH #1 - Prior to commencing drilling at SOH #1, the diesel engine ventilation system was modified such that noise attenuation devices could be more effectively installed. Our report dated June 8, 1990, recommended that acoustically lined duct extensions be implemented on the diesel engine intake and discharge openings as well as around the generator box. We understand that these items, as well as other baffles, including one at the main winch, were completed before July 1, 1990.

Automated noise monitoring station "A" at the drilling site was located about 100 feet east of the drill hole. The automated noise monitoring station "B" was located between the residences of Jones and Loughlin since they were the closest to the rig.

The general wind pattern in the area near SOH #1 is that of tradewind flow from the north and/or northeast during the day time and light winds predominantly from the west at night. The sound levels propagating from the drilling operations are very dependent on the weather conditions.

The Pommerenk residence located about 5,000 feet ENE of the rig would normally experience propagation losses (Condition No. 2) at night

of about 34 dB, but temporary focusing under Propagation Condition No. 1 could reduce it to about 24 dB.

The Jones/Loughlin residences, about 1,000 feet southwest of the rig may often be in a downwind condition during the day time with sound propagation losses during Condition No. 2 of typically 20 dB. The Petricci residence is beyond the Jones/Loughlin residences at about 2,500 feet from the rig with sound propagation losses of about 28 dB during Condition No. 2. During the nighttime, all three residences are usually in a crosswind to the rig and propagation losses normally should be increased beyond those in Condition No. 2.

The Majeska residence is about 3,200 feet northwest of SOH #1 and is normally upwind of the rig during daytime tradewinds with much higher losses than the 28 dB for Condition No. 2. At nighttime the Majeska residence is usually in a cross wind condition.

The County Geothermal Noise Guidelines state that, at night (7 pm to 7 am), the noise level of 45 dBA should not be exceeded for 10% of the time in a 20-minute period, except that impact noise may be 10 dBA greater. During the daytime (7 am to 7 pm) the allowable levels are increased by 10 dBA.

The process of evaluating noise complaints involves reviewing: (a.) the comments on the Public Contact Sheet; (b.) the noise levels from the chart from monitor station "A"; (c.) the activities occurring at the rig in the Daily Drilling Report; and (d.) the wind speed and

direction and rainfall information at three meteorological stations: "Woods", "Thermal Power" and "SOH #1." Then the sound propagation loss condition which most likely occurred during the time of the complaints is estimated in order to obtain a range of noise levels most likely at the listener's position.

D. Evaluation of Specific Noise Complaints

1. Noise Complaint on June 1, 1990 - This complaint from Debbie Pommerenk cited the "sound of the drill rig" involving the start up operations at SOH #1. Monitoring station "A" at the rig shows steady levels of 53 to 60 dBA with transients up to 80 dBA. These source levels definitely should not have caused levels at the complainants' residence to exceed the County noise limits.

2. Noise Complaints on June 4, 1990 - The chart from the rig monitoring station show that from about midnight on June 2, 1990 to about noon on June 4, 1990, there was almost a continuous sound level of 70 dBA (with periods of up to 73 dBA) associated with opening the hole to 12" diameter down to 202 feet deep. This operation was unusually noisy; and, reportedly, the dominant noise source was from vibration of the drill rod rather than the diesel. It is also to be noted that the additional noise mitigation measures mentioned above had not yet been implemented. Following are comments on the specific complaints obtained on June 4, 1990 from this operation:

(a.) The Public Contact Sheet citing Paul Majeska as complainant reported that "it was very still that night and machinery noise woke him up." The meteorological records show that the Majeska residence was generally upwind during the night and noise levels there should have been less than 40 dBA. However, in view of the quiet ambient, the relatively new sound in the area was obviously apparent to the complainant.

(b.) The contact sheet citing Debbie Pommerenk as complainant stated the rig was "really loud last night" and, from 3:30 am to 6:30 am on June 3rd. During the two-day period, the Pommerenk residence was downwind of the rig several times which implies that, theoretically, noise levels of 36 dBA were probably common; and for short periods of time, levels to 46 dBA may have occurred. While such levels were considered intrusive, the limit of 45 dBA for 10% of the time should not have been exceeded during periods of temporary focusing.

(c.) The contact sheet for Bob Petricci stated that "the drill rig was noisy last night." The meteorological records show that the Petricci residence was downwind much of the night of June 3rd and the early morning of June 4th. This implies that fairly constant levels of 37 to 42 dBA may have been

experienced; and at times, during focusing, peaks ranging from 47 to 52 dBA may have existed. The limit of 45 dBA for 10% of the time may, or may not, have been exceeded during periods of temporary focusing.

(d.) The contact sheet for Richard Jones states that noise "woke him up the last two nights;" but that during the daytime, it was "O.K." Because of downwind conditions during the two nights, constant levels theoretically could have ranged from 45 to 50 dBA; and during focusing phenomena, could have theoretically ranged from 55 to 60 dBA. However, analysis of the chart record from monitoring station "B" at the Jones/Loughlin location did not show 45 dBA being exceeded for 10% of the time during the nighttime. Typical continuous levels of 42 dBA on the night of June 2nd may have been attributable to this noisy operation at the rig and readily could have disturbed the complainants.

3. Noise Complaint on June 13, 1990 - A contact sheet states that Bonnie Gold complained of "noise all night, bulldozing all day." We have been unable to locate the Gold residence. The Drilling Report states that the rig was on standby June 11, 12, and 13: "waiting on Hawaii County Planning Commission for approval to resume drilling. Crew painting rig, fabricating additional sound absorption structures, cleaning up site." The chart from monitoring station

"A" at the rig shows a constant 45 dBA with a few impact noise events for June 12th. On June 13th, the chart record stopped, usually meaning the diesel engine and electric generator were shut down for some period of time. At any rate, there was very low activity at the site, and it is assumed the complainant heard a bulldozer not associated with the SOH program.

4. Noise Complaint on June 28, 1990 - A contact sheet states that Debbie Pommerenk "complained about nighttime noise 3 am on...". The meteorological records show that the Pommerenk residence was downwind of the rig from 3 am to 7 am on June 13. During this period, the SOH #1 noise data show steady levels of about 55 to 60 dBA, with transient levels reaching as high as about 75 dBA. During focusing phenomena, the levels at the Pommerenk residence could have ranged from about 31 to 51 dBA, and the limit of 45 dBA for 10% of the time may, or may not, have been exceeded.

Sincerely yours

David L. Adams

David L. Adams, P.E.

Mike S. Lee

encl.

DLA/MSL:msl

Table I - Summary of Noise Monitoring Activities from 4/1/90 to 6/30/90

LOCATION	MON. STA.	DATA SET	START DATE	STOP DATE	DAYS ON LINE	REMARKS
LOUGHLIN	B	14c	3/30/90	4/9/90	9	PAPER TORE OFF NO DATA: 4/8-4/9; INTERMITTENT QUESTIONABLE DATA-PROBABLY BAD MIC;
SOH #4	A	14b	4/2	4/16	13	NO POWER: 4/12, 15:00-4/13, 9:30
LOUGHLIN	B	14d	4/9	4/16	7	INTERMITTENT QUESTIONABLE DATA-PROBABLY BAD MIC; STATION B OUT OF SERVICE AFTER 4/16
SOH #4	A	15a	4/16	5/2	14	PAPER JAMMED:4/16-4/18; NO POWER: 4/27, 10:16-13:00
SOH #4	A	16a	5/2	5/4	0	PAPER JAMMED:5/2-5/4
SOH #4	A	16b	5/4	5/16	11	PAPER JAMMED:5/13-5/14
SOH #4	A	17a	5/16	5/23	6	INTERMITTENT POWER OUTAGE, TOTAL OF 36 HRS OF DATA LOST; END OF MONITORING @ SOH #4
LOUGHLIN	B	17b	5/16	5/18	2	STATION B BACK IN OPERATION, SAME MIC HEIGHT & LOCATION AS BEFORE
LOUGHLIN	B	17b	5/18	5/24	6	NEW MIC HEIGHT & LOCATION, 11.5' HIGH; QUESTIONABLE DATA, PROBABLY BAD MIC CORD

Table I - Summary of Noise Monitoring Activities from 4/1/90 to 6/30/90

LOCATION	MON STA	DATA SET	START DATE	STOP DATE	DAYS ON LINE	REMARKS
LOUGHLIN	B	17c	5/24	5/26	1	PAPER TORE OFF, NO DATA:5/24-5/25; QUESTIONABLE DATA, BAD MIC CORD
LOUGHLIN	B	17d	5/26	6/1	3	PAPER TORE OFF, NO DATA:5/26-5/28; PEN DRIED UP:5/29, 5:00-5/30,8:15; QUESTIONABLE DATA, BAD MIC CORD
SOH #1	A	18a	6/1	6/15	13	DRILLING STARTED @ SOH #1, INTERMITTENT POWER OUTAGE:8 HRS OF DATA LOST b/ 6/4-6/6; 31 HRS OF DATA LOST b/ 6/8-6/15
LOUGHLIN	B	18b	6/1	6/15	14	QUESTIONABLE DATA: 6/1-6/6, NEW MIC CABLE INSTALLED ON 6/6, DATA LOOKS OK
SOH #1	A	19a	6/15	6/29	9	PAPER JAMMED & PEN DRIED UP:6/15-6/20 INTERMITTENT POWER OUTAGE:6/25,8:00-6/27,8:37-7 HRS OF DATA LOST
LOUGHLIN	B	19b	6/15	6/20	5	NO POWER:6/15,6:00 -11:30
LOUGHLIN	B	19c	6/20	6/29	8	PEN DRIED UP:6/26, 18:00-6/27,8:48
SOH #1	A	20a	6/29	7/16	14	RIG DOWN, 7/8-7/11
LOUGHLIN	B	20b	6/29	7/16	17	PEN DRIED UP, DATA BARELY READABLE: 7/3,3:00-7/6,8:51

NOTE: RIG WENT ON STANDBY WAITING ON HAWAII COUNTY PLANNING COMMISSION FOR APPROVAL TO RESUME DRILLING FROM 6/9-6/15/90

D.L. ADAMS ASSOCIATES, LTD.
dba
DARBY
& ASSOCIATES
ACOUSTICAL CONSULTANTS

ENCLOSURE 1

#89-10
June 12, 1990

Mr. Art Seki
University of Hawaii
Hawaii Natural Energy Institute
2540 Dole St., Holmes Hall #206
Honolulu, Hawaii 96822

Subject: Noise Complaint Evaluations in April, SOH #4 - SOH Program, Puna, Hawaii

Dear Mr. Seki:

Our report dated April 10, 1990 provided a summary of noise level data recorded from January 6, 1990 to March 30, 1990. Two automatic noise monitoring stations have been in operation since March 30, 1990, and also selected manual noise level measurements have been made by Steve Avery. A summary report is forthwith coming. This letter represents a response to two specific noise complaints by Ms. Edla "Carrie" Chory:

1. Noise Complaint on April 3, 1990 - No specific time of day or nature of the noise is provided on the "Public contact Sheet." Review of the noise level record from the monitoring station at SOH #4 on April 2nd and 3rd indicates that the noise levels were below 70 dBA except for a few transient events that went to the low 70's. Review of the Daily Drilling Reports for those two days did not show any unusual problems. Review of the meteorological data from SOH #4 indicates that there was very little rain on those two days and that the noise source was never upwind of the listener. Most of the time the noise source was downwind, but for some periods there was a transitional condition where there was

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a chance of stronger sound propagation and some of the few transient events may have been audible. However, in consideration of all of the above factors, there is no evidence that the Geothermal Noise Guidelines would have been exceeded.

2. Noise Complaint on April 27, 1990 - The Public Contact Sheet dated April 27, 1990 states "the resident complained of noise previous two nights...she stated engine was 'revving.'" The Daily Drilling Report dated April 26, 1990 states that between 7 am on April 26, 1990 and 7 am on April 27, 1990 there was both "trip-out" and "trip-in-hole." The noise level chart for that time period shows continuous, repetitive, transient noises from about 11 am to 5 pm on April 26, 1990 which is assumed to be the trip-out; and again from about 11 pm to 8 am, assumed to be the trip-in. The latter event had two quiet periods totalling about 2 hours. The noise level peaks during these events were typically about 72 dBA. The meteorological data show that during the daytime trip-out, the wind was from the ESE or in a transitional condition with respect to the extremes of sound propagation. However, during the nighttime trip-in, the wind was from the SSW at about 2 mph and the noise source was upwind of the listener. There was no rainfall recorded during the trip-in period. Thus, during trip-in, there is a good possibility that strong sound propagation conditions existed and the complainant readily could hear repeated "revving" of the engine. At the 3,900 foot separation distance with propagation Condition No. 1 in effect, instantaneous peak noise levels at the listener theoretically

could have ranged from 39 to 49 dBA. Though the noise was considered intrusive for this combination of a noisy event and strong propagation conditions, it is believed that while the Geothermal Noise Guideline limits may have been approached, they probably were not exceeded when one takes into account the "10% of the time in any 20 minute period" condition and the allowance for "impact" noise.

Sincerely,

David K. Adams
for Ronald A. Darby, P.E.

RAD/ld

APPENDIX H

FINANCIAL REPORT

DBED $3,000,000
AGREEMENT FOR A GEOTHERMAL RESOURCE DEVELOPMENT, HAWAII (RCUH 3908-00)

BUDGET CATEGORY	AMOUNT AWARDED	AMOUNT EXPENDED AS OF 6/29/90	AMOUNT ENCUMBERED	AVAILABLE BALANCE
Salaries	$77,500.00	$31,872.97	$0.00	$45,627.03
Fringe	$20,000.00	$4,006.03	$0.00	$15,993.97
Equipment	$165,000.00	$87,632.10	$27,690.59	$49,677.31
Supplies	$350,500.00	$309,964.52	$25,379.11	$15,156.37
Travel	$25,000.00	$17,488.56	$518.13	$6,993.31
Consultant	$195,000.00	$202,209.56	-$80,557.66	$73,348.10
Publications	$0.00	$0.00	$0.00	$0.00
Miscellaneous	$142,000.00	$140,593.48	$22,304.49	-$20,897.97
Indirect Costs	$25,000.00	$25,000.00	$0.00	$0.00
Drilling	$2,000,000.00	$1,119,145.79	$955,384.91	-$74,530.70
TOTAL	**$3,000,000**	**$1,912,913.01**	**$950,719.57**	**$111,367.42**